VOL. 7, NO. 12
June 30, 1982

Energy Research Abstracts

ABSTRACTS 31716-32933

Technical Information Center
UNITED STATES DEPARTMENT OF ENERGY

CURRENT AWARENESS PUBLICATIONS ON ENERGY

To provide complete coverage of literature related to major Department programs, announcement publications that are comprehensive in their coverage of certain energy fields are issued regularly. All information in these publications, plus additional backup information, is included in the Energy Data Base of the Technical Information Center; all references are also available for machine searching via the on-line retrieval system, DOE/RECON, and the commercial on-line retrieval systems. Descriptions of these current awareness publications, which are supported either directly or indirectly by the DOE, appear below. Department of Energy components may receive the listed publications free from the Technical Information Center, P.O. Box 62, Oak Ridge, TN 37830. Telephone (615) 576-1303; (FTS) 626-1303.

PUBLICATIONS OF THE TECHNICAL INFORMATION CENTER

Energy Abstracts for Policy Analysis (EAPA)
A monthly abstract journal devoted to the analysis of energy research, conservation, and policy. Scope and coverage are limited to substantive articles or reports and emphasize the following: programmatic efforts; legislative, regulatory, and other legal aspects; social, economic, and environmental impacts; regional and sectoral analyses; institutional factors, etc. *EAPA* is available from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402; domestic subscribers $4.50, foreign $5.65 per copy; annual cumulative index, domestic $7.00, foreign $8.75 per copy. The annual subscription price is $48.00 for domestic subscribers and $60.00 for foreign subscribers.

Energy Research Abstracts (ERA)
A comprehensive semimonthly abstract journal devoted to all areas of energy-related information produced by the Department of Energy, other U. S. government organizations, and foreign governments. *ERA* is available to the public on a subscription basis from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402. The subscription rate for the 24 semimonthly issues is $150.00 for domestic subscribers and $187.50 for foreign subscribers. A single issue costs $6.50 (domestic) or $8.15 (foreign).

The following publications are available to the public on a subscription basis from the National Technical Information Service (NTIS), Springfield, Virginia 22161. The annual subscription rate for one volume (calendar) year (12 issues plus cumulative index) is $75.00 for domestic subscribers and $150.00 for subscribers outside the North American Continent, except as listed below for *DOE Patents Available for Licensing (PAL)*. A single issue is $7.00 (domestic) and $14.00 (outside the North American Continent).

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A monthly publication providing abstracting and indexing coverage of the international patent literature, including patent applications, that concerns any aspect of energy production, conservation, and utilization. Available as PB82-902800.

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Fossil Energy Update (FEU)
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Fusion Energy Update (CFU)
A monthly abstract journal devoted to information on controlled thermonuclear research. Available as PB82-915300.

Geothermal Energy Update (GEU)
A monthly abstract journal devoted to information on the exploration and development of geothermal resources. Available as PB82-914700.

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Nuclear Fuel Cycle (NFC)
A semimonthly current awareness bulletin covering all aspects of the nuclear fuel cycle, both front end and back end. Available as PB82-913400.

Nuclear Reactor Safety (NRS)
A semimonthly current awareness bulletin covering the following safety aspects: accident analysis, safety systems, radiation protection, decommissioning and dismantling, and security measures. Available as PB82-913500.

Radioactive Waste Management (RWM)
A semimonthly current awareness bulletin covering the following management aspects: transport and storage, waste processing, waste disposal, waste storage, radioactive effluents, and shipping containers. Available as PB82-902900.

INTERNATIONAL ENERGY PUBLICATIONS

Atomindex (Published in cooperation with the Technical Information Center by the International Atomic Energy Agency, International Nuclear Information System, Vienna, Austria)
A semimonthly abstract journal devoted to information on nuclear science and technology. Through an exchange agreement, IAEA/INIS provides all non-U. S. nuclear information of *Atomindex* to TIC for inclusion in the Energy Data Base; in turn, TIC provides all U. S. nuclear information to IAEA/INIS for inclusion in *Atomindex*. *Atomindex* is available by subscription from UNIPUB, 345 Park Avenue South, New York, NY 10010. The cost of an annual subscription, 24 semimonthly issues and semiannual and annual cumulative indexes, is $290.

Coal Abstracts (Published in cooperation with the Technical Information Center by the International Energy Agency, IEA Coal Research, London, England)
A monthly abstract journal devoted to information on coal. Through an exchange agreement, IEA Coal Research provides non-U. S. coal information of *Coal Abstracts* to TIC for inclusion in the Energy Data Base; in turn, TIC provides all U. S. coal information to IEA Coal Research for inclusion in *Coal Abstracts*. *Coal Abstracts* is available to Department of Energy components and contractors from the Technical Information Center. Non-DOE organizations may obtain *Coal Abstracts* from IEA Coal Research, Technical Information Service, 14-15 Lower Grosvenor Place, London SW1W 0EX, England, for 100 pounds sterling per year.

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ENERGY RESEARCH ABSTRACTS

ABOUT THE TECHNICAL INFORMATION CENTER

The Technical Information Center in Oak Ridge, Tennessee, has been the national center for scientific and technical information for the Department of Energy (DOE) and its predecessor agencies since 1946. In developing and managing DOE's technical information program, the Center places under bibliographic control not only DOE-originated information but also worldwide literature on scientific and technical advances in the energy field and announces the source and availability of this information. Whereas the literature of science is emphasized, coverage is extended to DOE programmatic, socioeconomic, environmental, legislative/regulatory energy analysis, and policy-related areas. To accomplish this mission, the Center builds and maintains computerized energy-information data bases and disseminates this information via computerized retrieval systems and announcement publications such as abstracting journals, bibliographies, and update journals. Direct access to the Center's most comprehensive data base, the Energy Data Base, is available to the public through commercial on-line bibliographic retrieval systems. The Energy Data Base and many of the Center's energy-related data bases are available to DOE offices and contractors and to other government agencies via DOE/RECON, the Department's on-line information retrieval system. The Center has developed and maintains systems to record and communicate energy-related research-in-progress information, to catalog official DOE issue-and-policy documents, to maintain a register of DOE public communications publications, to track research report deliverables from DOE contractors, and to test and make available DOE-funded computer software programs with scientific and management applications. The Center also maintains a full-scale publishing capability to serve special publication needs of the Department. To effectively manage DOE's technical information resources, the Center's program is one of continual development and evaluation of new information products, systems, and technologies.

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Energy Research Abstracts (ERA) provides abstracting and indexing coverage of all scientific and technical reports, journal articles, conference papers and proceedings, books, patents, theses, and monographs originated by the U. S. Department of Energy, its laboratories, energy centers, and contractors. *ERA* also covers other energy information prepared *in report form* by federal and state government organizations, foreign governments, and domestic and foreign universities and research organizations. The user should remain aware that *ERA* coverage of non-report literature is limited to that generated by Department of Energy activity.

ERA is comprehensive in its subject scope, encompassing the DOE's research, development, demonstration, and technological programs resulting from its broad charter for energy sources, supplies, safety, environmental impacts, and regulation.

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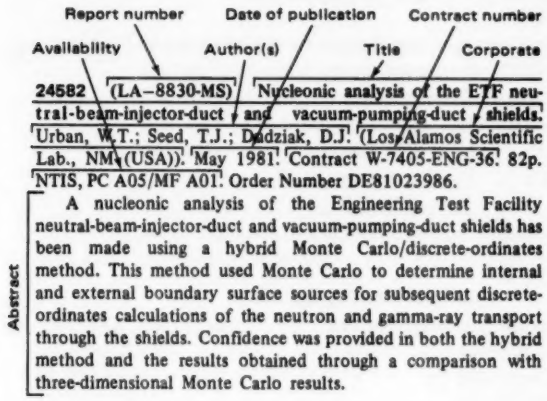
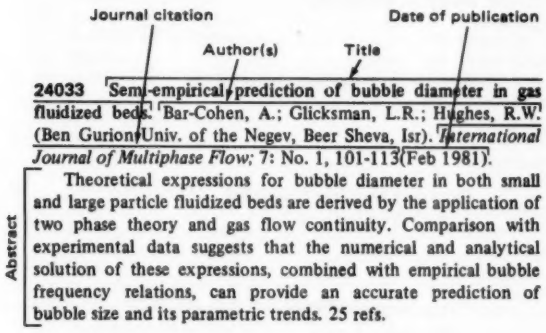
• ABSTRACTS IN *ENERGY RESEARCH ABSTRACTS*

The principal elements of abstract entries for a typical research and development report and a typical technical journal article are illustrated below.



24582 (LA–8830-MS) Nucleonic analysis of the ETF neutral-beam-injector-duct and vacuum-pumping-duct shields. Urban, W.T.; Seed, T.J.; Dudziak, D.J. (Los Alamos Scientific Lab., NM (USA)). May 1981. Contract W-7405-ENG-36. 82p. NTIS, PC A05/MF A01. Order Number DE81023986.

A nucleonic analysis of the Engineering Test Facility neutral-beam-injector-duct and vacuum-pumping-duct shields has been made using a hybrid Monte Carlo/discrete-ordinates method. This method used Monte Carlo to determine internal and external boundary surface sources for subsequent discrete-ordinates calculations of the neutron and gamma-ray transport through the shields. Confidence was provided in both the hybrid method and the results obtained through a comparison with three-dimensional Monte Carlo results.



24033 Semi-empirical prediction of bubble diameter in gas fluidized beds. Bar-Cohen, A.; Glicksman, L.R.; Hughes, R.W. (Ben Gurion Univ. of the Negev, Beer Sheva, Isr). *International Journal of Multiphase Flow;* 7: No. 1, 101-113 (Feb 1981).

Theoretical expressions for bubble diameter in both small and large particle fluidized beds are derived by the application of two phase theory and gas flow continuity. Comparison with experimental data suggests that the numerical and analytical solution of these expressions, combined with empirical bubble frequency relations, can provide an accurate prediction of bubble size and its parametric trends. 25 refs.

• INDEXES TO *ENERGY RESEARCH ABSTRACTS*

Five indexes are provided for approaching the contents of each issue of *Energy Research Abstracts (ERA).* Each index is preceded by an introduction that details the organization of the index and the principles by which it was compiled. The reader is referred to these introductions for information not found in the index examples that follow.

• Corporate Author Index

Technical report literature is indexed using the name of the organization or institution responsible for the issuance of the report.

24582 (LA–8830-MS) Nucleonic analysis of the ETF neutral-beam-injector-duct and vacuum-pumping-duct shields. Urban, W.T.; Seed, T.J.; Dudziak, D.J. **(Los Alamos Scientific Lab., NM (USA)).** May 1981. Contract W-7405-ENG-36. 82p. NTIS, PC A05/MF A01. Order Number DE81023986.

is indexed as:

Los Alamos Scientific Lab., NM (USA)
Nucleonic analysis of the ETF neutral-beam-injector-duct and vacuum-pumping-duct shields, 6:24582 (LA–8830-MS)

• Personal Author Index

Each author's name is indexed in the form appearing on the document abstracted, with the exception that given names are reduced to initials:

Bar-Cohen, A., Semi-empirical prediction of bubble diameter in gas fluidized beds, 7:24033
Dudziak, D.J., *See* Urban, W.T., 6:24582
Glicksman, L.R., *See* Bar-Cohen, A., 7:24033
Hughes, R.W., *See* Bar-Cohen, A., 7:24033
Seed, T.J., *See* Urban, W.T., 6:24582
Urban, W.T., Nucleonic analysis of the ETF neutral-beam-injector-duct and vacuum-pumping-duct shields, 6:24582 (LA–8830-MS)

• Subject Index

The subject index consisting of entries naming specific materials, objects, and processes is arranged alphabetically. Document titles or informative phrases, or both, specific to these entries are arranged alphabetically under the entries.

TOKAMAK ETF
Neutral Atom Beam Injection
Nucleonic analysis of the ETF neutral-beam-injector-duct and vacuum-pumping-duct shields, 6:24582 (LA–8830-MS)
Neutron Transport
Nucleonic analysis of the ETF neutral-beam-injector-duct and vacuum-pumping-duct shields, 6:24582 (LA–8830-MS)

• Contract Number Index

DOE technical literature is indexed using contract numbers under which the literature was produced. This index contains the contract number with corresponding abstract and report numbers.

W-7405-ENG-36	**Los Alamos National Lab., NM (USA)**	
	6:24582	**LA–8830-MS**

• Report Number Index

Technical report literature is also indexed using report numbers. This index includes information on where individual reports may be obtained. Patents and conference papers are indexed here as a matter of convenience. When a report is supplied under an Order Number, that number is included in the availability statement. An Order Number-Report Number Correlation is included for convenience.

LA–		
8830-MS	**6:24582**	**NTIS, PC A05/MF A01. Order Number DE81023986, Distribution Category STD-20d**

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SUBJECT CONTENTS (NUMERICAL LISTING)

Six-digit subject category numbers are used in the storage, retrieval, and manipulation of bibliographic information entered into DOE's computerized bibliographic information system. The six-digit category numbers are utilized as if they were three pairs of two-digit numbers, the first two pairs being used to arrange the abstract content of *Energy Research Abstracts*. The following listing includes the totality of the 40 first-level and 294 second-level subject categories used. Because each issue of *ERA* announces only those documents becoming available during a semimonthly period, some subject categories may not be represented in every issue. The complete subject category scheme with scope notes is available as DOE/TIC-4584-R4 from NTIS for $7.00.

01 COAL AND COAL PRODUCTS
- 04 Processing
- 05 By-Products
- 06 Properties
- 08 Waste Management
- 09 Environmental Aspects
- 10 Reserves and Exploration
- 20 Mining
- 30 Transport and Handling
- 40 Combustion
- 50 Marketing and Economics
- 60 Health and Safety
- 70 Regulations

02 PETROLEUM
- 01 Reserves
- 02 Geology and Exploration
- 03 Drilling and Production
- 04 Processing
- 05 Products and By-Products
- 06 Health and Safety
- 07 Marketing and Economics
- 08 Waste Management
- 09 Environmental Aspects
- 10 Policy, Legislation, and Regulation
- 20 Transport, Pipelines, and Handling
- 30 Properties
- 40 Storage
- 50 Combustion

03 NATURAL GAS
- 01 Reserves
- 02 Geology and Exploration
- 03 Drilling, Production, and Processing
- 04 Products and By-Products
- 05 Health and Safety
- 06 Marketing and Economics
- 07 Waste Management
- 08 Environmental Effects
- 09 Artificial Stimulation, Plowshare, etc.
- 10 Policy, Legislation, and Regulation
- 20 Transport, Pipelines, and Handling
- 30 Properties
- 40 Combustion
- 50 Storage

04 OIL SHALES AND TAR SANDS
- 01 Reserves and Exploration
- 02 Site Geology and Hydrology
- 03 Drilling, Fracturing, and Mining
- 04 Oil Production, Recovery, and Refining
- 05 Properties and Composition
- 06 Direct Uses and By-Products
- 07 Health and Safety
- 08 Marketing and Economics
- 09 Waste Research and Management
- 10 Environmental Aspects
- 20 Regulations

05 NUCLEAR FUELS
- 01 Reserves
- 02 Exploration
- 03 Mining
- 04 Feed Processing
- 05 Enrichment
- 06 By-Products
- 07 Fuels Production and Properties
- 08 Spent Fuels Reprocessing
- 09 Transport and Storage
- 10 Marketing and Economics
- 20 Waste Management
- 30 Environmental Aspects
- 40 Health and Safety
- 50 Regulations

06 FUSION FUELS
- 01 Sources
- 02 Processing
- 03 By-Products
- 04 Transport and Storage
- 05 Health and Safety
- 06 Regulations and Policy
- 07 Waste Management
- 08 Properties
- 09 Environmental Aspects

07 ISOTOPE AND RADIATION SOURCE TECHNOLOGY
- 01 Physical Isotope Separation
- 02 Radiation Sources
- 03 Isotopic Power Supplies

08 HYDROGEN
- 01 Production
- 02 Storage
- 03 Transport
- 04 Marketing and Economics
- 05 Safety
- 06 Industrial and Commercial Use
- 07 By-Products
- 08 Properties
- 09 Environmental Aspects

09 OTHER SYNTHETIC AND NATURAL FUELS
- 01 Hydrocarbon Fuels
- 02 Alcohol Fuels
- 03 Inorganic Hydrogen Compound Fuels
- 04 Solid Waste Fuels
- 05 Liquid Waste Fuels
- 06 Gaseous Waste Fuels

13 HYDRO ENERGY
- 01 Resources and Availability
- 02 Site Geology and Meteorology
- 03 Plant Design and Operation
- 04 Regulations and Licensing
- 05 Economics and Management
- 06 Environmental Aspects
- 07 Power Conversion Systems

14 SOLAR ENERGY
- 01 Resources and Availability
- 03 Economics
- 04 Environmental, Legal, and Institutional Aspects
- 05 Solar Energy Conversion
- 06 Photovoltaic Power Plants
- 07 Solar Thermal Power Plants
- 08 Ocean Thermal Gradient Power Plants
- 09 Solar Radiation Utilization
- 10 Solar Collectors and Concentrators
- 20 Heat Storage

15 GEOTHERMAL ENERGY
- 01 Resource Status and Assessment
- 02 Geology, Hydrology, and Geothermal Systems
- 03 Geothermal Exploration and Exploration Technology
- 04 Legal and Institutional Aspects

15 GEOTHERMAL ENERGY (CONT.)
- 05 Economic and Financial Aspects
- 06 Environmental Aspects and Waste Disposal
- 07 By-Products
- 08 Geothermal Power Plants
- 09 Geothermal Engineering
- 10 Direct Energy Utilization
- 20 Geothermal Data and Theory

16 TIDAL POWER
- 03 Regulations
- 04 Economics
- 05 Environmental Aspects
- 07 Tidal Power Plants
- 08 Wave Energy Converters

17 WIND ENERGY
- 01 Availability (Climatology)
- 03 Regulations
- 04 Economics
- 05 Environmental Aspects
- 06 Wind Energy Engineering

20 ELECTRIC POWER ENGINEERING
- 01 Power Plants and Power Generation
- 02 Environmental Aspects
- 03 Power Transmission and Distribution

21 NUCLEAR POWER PLANTS
- 01 Power Reactors, Non-Breeding, Light-Water Moderated, Boiling Water Cooled
- 02 Power Reactors, Non-Breeding, Light-Water Moderated, Non-Boiling Water Cooled
- 03 Power Reactors, Non-Breeding, Graphite Moderated
- 04 Power Reactors, Non-Breeding, Otherwise Moderated or Unmoderated
- 05 Power Reactors, Breeding
- 06 Power Reactors, Auxiliary, Mobile, Package, and Transportable
- 07 Regulation and Licensing
- 08 Economics
- 09 Process Heat Reactors

22 NUCLEAR REACTOR TECHNOLOGY
- 01 Theory and Calculation
- 02 Components and Accessories
- 03 Fuel Elements
- 04 Control Systems
- 05 Environmental Aspects
- 06 Research, Test, and Experimental Reactors
- 07 Plutonium and Isotope Production Reactors
- 08 Propulsion Reactors
- 09 Reactor Safety

25 ENERGY STORAGE
- 01 Magnetic
- 02 Compressed Gas
- 03 Pumped Hydro
- 04 Capacitor Banks
- 05 Flywheels
- 06 Thermal
- 07 Liquefied Gas
- 08 Chemical
- 09 Batteries

29 ENERGY PLANNING AND POLICY
- 01 Energy Analysis and Modeling
- 02 Economics and Sociology
- 03 Environment, Health, and Safety
- 04 Natural Resources
- 05 Research, Development, Demonstration, and Commercialization
- 06 Nuclear Energy
- 07 Transport and Storage
- 08 Waste Heat Utilization
- 10 Conservation
- 20 Supply, Demand, and Forecasting
- 30 Policy, Legislation, and Regulation
- 40 Fossil Fuels
- 50 Hydrogen and Synthetic Fuels
- 60 Electric Power
- 80 Consumption and Utilization
- 90 Unconventional Sources and Power Generation

30 ENERGY CONVERSION
- 01 MHD Generators
- 02 EHD Generators
- 03 Thermoelectric Generators
- 04 Thermionic Converters
- 05 Fuel Cells
- 08 Electromechanical Converters

32 ENERGY CONSERVATION, CONSUMPTION, AND UTILIZATION
- 01 Buildings
- 02 Transportation
- 03 Industry and Agriculture
- 06 Municipalities and Community Systems
- 09 Education and Public Relations

33 ADVANCED AUTOMOTIVE PROPULSION SYSTEMS
- 01 Internal Combustion Engines
- 02 External Combustion Engines
- 03 Electric-Powered Systems
- 04 Hybrid Systems
- 05 Flywheel Propulsion
- 06 Vehicle Design Factors
- 07 Emission Control
- 08 Alternative Fuels

36 MATERIALS
- 01 Metals and Alloys
- 02 Ceramics, Cermets, and Refractories
- 03 Composite Materials
- 04 Polymers and Plastics
- 06 Other Materials

40 CHEMISTRY
- 01 Analytical and Separations Chemistry
- 02 Inorganic and Physical Chemistry
- 03 Organic Chemistry
- 04 Electrochemistry
- 05 Photochemistry
- 06 Radiation Chemistry
- 07 Radiochemistry and Nuclear Chemistry
- 08 Combustion Chemistry

42 ENGINEERING
- 01 General Engineering
- 02 Facilities and Equipment
- 03 Lasers
- 04 Heat Transfer and Fluid Flow
- 05 Materials Testing

42 ENGINEERING (CONT.)
- 06 Safety Engineering
- 07 Vacuum Engineering
- 08 Electronic Circuits and Devices
- 09 Waste Processing Plants and Equipment
- 10 Combustion Systems
- 20 Underground Engineering
- 30 Marine Engineering
- 40 Pollution Control Equipment
- 50 Power Cycles

43 PARTICLE ACCELERATORS
- 01 Design, Development, and Operation
- 02 Beam Dynamics, Field Calculations, and Ion Optics
- 03 Auxiliaries and Components
- 04 Storage Rings

44 INSTRUMENTATION
- 01 Radiation Instrumentation
- 02 Radiation Effects on Instrument Components, Instruments, or Electronic Systems
- 03 Miscellaneous Instruments
- 04 Well Logging Instrumentation

45 EXPLOSIONS AND EXPLOSIVES
- 01 Chemical
- 02 Nuclear
- 03 Explosion Detection

50 ENVIRONMENTAL SCIENCES, ATMOSPHERIC
- 01 Basic Studies
- 02 Chemicals Monitoring and Transport
- 03 Radioactive Materials Monitoring and Transport
- 04 Thermal Effluents Monitoring and Transport
- 05 Site Resource and Use Studies
- 06 Regulations

51 ENVIRONMENTAL SCIENCES, TERRESTRIAL
- 01 Basic Studies
- 02 Chemicals Monitoring and Transport
- 03 Radioactive Materials Monitoring and Transport
- 04 Thermal Effluents Monitoring and Transport
- 05 Site Resource and Use Studies
- 06 Regulations

52 ENVIRONMENTAL SCIENCES, AQUATIC
- 01 Basic Studies
- 02 Chemicals Monitoring and Transport
- 03 Radioactive Materials Monitoring and Transport
- 04 Thermal Effluents Monitoring and Transport
- 05 Site Resource and Use Studies
- 06 Regulations

53 ENVIRONMENTAL–SOCIAL ASPECTS OF ENERGY TECHNOLOGIES
- 01 Social and Economic Studies
- 02 Assessment of Energy Technologies
- 03 Environmental Impact Statements

55 BIOMEDICAL SCIENCES, BASIC STUDIES
01 Behavioral Biology
02 Biochemistry
03 Cytology
04 Genetics
05 Metabolism
06 Medicine
07 Microbiology
08 Morphology
09 Pathology
10 Physiological Systems
20 Public Health
30 Agriculture and Food Technology

56 BIOMEDICAL SCIENCES, APPLIED STUDIES
01 Radiation Effects
02 Thermal Effects
03 Chemicals Metabolism and Toxicity
04 Other Environmental Pollutant Effects

57 HEALTH AND SAFETY

58 GEOSCIENCES
01 Geology and Hydrology
02 Geophysics
03 Mineralogy, Petrology, and Rock Mechanics
04 Geochemistry
05 Oceanography

64 PHYSICS RESEARCH
01 Astrophysics and Cosmology
02 Atmospheric Physics
03 Atomic, Molecular, and Chemical Physics
04 Fluid Physics
50 High Energy Physics

65 PHYSICS RESEARCH (CONT.)
10 Nuclear Physics
40 Radiation and Shielding Physics
50 Medical Physics
60 Solid State Physics
70 Theoretical Physics
80 Mathematical Physics
90 Communication, Education, History, and Philosophy

70 FUSION ENERGY
01 Plasma Research
02 Fusion Power Plant Technology

99 GENERAL AND MISCELLANEOUS
01 Management
02 Mathematics and Computers
03 Information Handling
04 Law
05 Civilian Defense

CORPORATE AUTHOR INDEX

PERSONAL AUTHOR INDEX

SUBJECT INDEX

CONTRACT NUMBER INDEX

REPORT NUMBER INDEX

ORDER NUMBER CORRELATION

SUBJECT CONTENTS (ALPHABETICAL LISTING)

Six-digit subject category numbers are used in the storage, retrieval, and manipulation of bibliographic information entered into DOE's computerized bibliographic information system. The six-digit category numbers are utilized as if they were three pairs of two-digit numbers, the first two pairs being used to arrange the abstract content of *Energy Research Abstracts*. The following listing includes the totality of the 40 first-level and 294 second-level subject categories used. Because each issue of *ERA* announces only those documents becoming available during a semimonthly period, some subject categories may not be represented in every issue. The complete subject category scheme with scope notes is available as DOE/TIC-4584-R4 from NTIS for $7.00.

33 ADVANCED AUTOMOTIVE PROPULSION SYSTEMS
- 08 Alternative Fuels
- 03 Electric-Powered Systems
- 07 Emission Control
- 02 External Combustion Engines
- 05 Flywheel Propulsion
- 04 Hybrid Systems
- 01 Internal Combustion Engines
- 06 Vehicle Design Factors

56 BIOMEDICAL SCIENCES, APPLIED STUDIES
- 03 Chemicals Metabolism and Toxicity
- 04 Other Environmental Pollutant Effects
- 01 Radiation Effects
- 02 Thermal Effects

55 BIOMEDICAL SCIENCES, BASIC STUDIES
- 30 Agriculture and Food Technology
- 01 Behavioral Biology
- 02 Biochemistry
- 03 Cytology
- 04 Genetics
- 06 Medicine
- 05 Metabolism
- 07 Microbiology
- 08 Morphology
- 09 Pathology
- 10 Physiological Systems
- 20 Public Health

40 CHEMISTRY
- 01 Analytical and Separations Chemistry
- 08 Combustion Chemistry
- 04 Electrochemistry
- 02 Inorganic and Physical Chemistry
- 03 Organic Chemistry
- 05 Photochemistry
- 06 Radiation Chemistry
- 07 Radiochemistry and Nuclear Chemistry

01 COAL AND COAL PRODUCTS
- 05 By-Products
- 40 Combustion
- 09 Environmental Aspects
- 60 Health and Safety
- 50 Marketing and Economics
- 20 Mining
- 04 Processing
- 06 Properties
- 70 Regulations
- 10 Reserves and Exploration
- 30 Transport and Handling
- 08 Waste Management

20 ELECTRIC POWER ENGINEERING
- 02 Environmental Aspects
- 01 Power Plants and Power Generation
- 03 Power Transmission and Distribution

32 ENERGY CONSERVATION, CONSUMPTION, AND UTILIZATION
- 01 Buildings
- 09 Education and Public Relations
- 03 Industry and Agriculture
- 06 Municipalities and Community Systems
- 02 Transportation

30 ENERGY CONVERSION
- 02 EHD Generators
- 08 Electromechanical Converters
- 05 Fuel Cells
- 01 MHD Generators
- 04 Thermionic Converters
- 03 Thermoelectric Generators

29 ENERGY PLANNING AND POLICY
- 10 Conservation
- 80 Consumption and Utilization
- 02 Economics and Sociology
- 60 Electric Power
- 01 Energy Analysis and Modeling
- 03 Environment, Health, and Safety
- 40 Fossil Fuels
- 50 Hydrogen and Synthetic Fuels
- 04 Natural Resources
- 06 Nuclear Energy
- 30 Policy, Legislation, and Regulation
- 05 Research, Development, Demonstration, and Commercialization
- 20 Supply, Demand, and Forecasting
- 07 Transport and Storage
- 90 Unconventional Sources and Power Generation
- 08 Waste Heat Utilization

25 ENERGY STORAGE
- 09 Batteries
- 04 Capacitor Banks
- 08 Chemical
- 02 Compressed Gas
- 05 Flywheels
- 07 Liquefied Gas
- 01 Magnetic
- 03 Pumped Hydro
- 06 Thermal

42 ENGINEERING
- 10 Combustion Systems
- 08 Electronic Circuits and Devices
- 02 Facilities and Equipment
- 01 General Engineering
- 04 Heat Transfer and Fluid Flow
- 03 Lasers
- 30 Marine Engineering
- 05 Materials Testing
- 40 Pollution Control Equipment
- 50 Power Cycles
- 06 Safety Engineering
- 20 Underground Engineering
- 07 Vacuum Engineering
- 09 Waste Processing Plants and Equipment

52 ENVIRONMENTAL SCIENCES, AQUATIC
- 01 Basic Studies
- 02 Chemicals Monitoring and Transport
- 03 Radioactive Materials Monitoring and Transport
- 06 Regulations
- 05 Site Resource and Use Studies
- 04 Thermal Effluents Monitoring and Transport

50 ENVIRONMENTAL SCIENCES, ATMOSPHERIC
- 01 Basic Studies
- 02 Chemicals Monitoring and Transport
- 03 Radioactive Materials Monitoring and Transport
- 06 Regulations
- 05 Site Resource and Use Studies
- 04 Thermal Effluents Monitoring and Transport

51 ENVIRONMENTAL SCIENCES, TERRESTRIAL
- 01 Basic Studies
- 02 Chemicals Monitoring and Transport
- 03 Radioactive Materials Monitoring and Transport
- 06 Regulations
- 05 Site Resource and Use Studies
- 04 Thermal Effluents Monitoring and Transport

53 ENVIRONMENTAL–SOCIAL ASPECTS OF ENERGY TECHNOLOGIES
- 02 Assessment of Energy Technologies
- 03 Environmental Impact Statements
- 01 Social and Economic Studies

45 EXPLOSIONS AND EXPLOSIVES
- 01 Chemical
- 03 Explosion Detection
- 02 Nuclear

70 FUSION ENERGY
- 02 Fusion Power Plant Technology
- 01 Plasma Research

06 FUSION FUELS
- 03 By-Products
- 09 Environmental Aspects
- 05 Health and Safety
- 02 Processing
- 08 Properties
- 06 Regulations and Policy
- 01 Sources
- 04 Transport and Storage
- 07 Waste Management

99 GENERAL AND MISCELLANEOUS
- 05 Civilian Defense
- 03 Information Handling
- 04 Law
- 01 Management
- 02 Mathematics and Computers

58 GEOSCIENCES
- 04 Geochemistry
- 01 Geology and Hydrology
- 02 Geophysics
- 03 Mineralogy, Petrology, and Rock Mechanics
- 05 Oceanography

15 GEOTHERMAL ENERGY
- 07 By-Products
- 10 Direct Energy Utilization
- 05 Economic and Financial Aspects
- 06 Environmental Aspects and Waste Disposal
- 02 Geology, Hydrology, and Geothermal Systems
- 20 Geothermal Data and Theory
- 09 Geothermal Engineering
- 03 Geothermal Exploration and Exploration Technology
- 08 Geothermal Power Plants
- 04 Legal and Institutional Aspects
- 01 Resource Status and Assessment

57 HEALTH AND SAFETY

13 HYDRO ENERGY
- 05 Economics and Management
- 06 Environmental Aspects
- 03 Plant Design and Operation
- 07 Power Conversion Systems
- 04 Regulations and Licensing
- 01 Resources and Availability
- 02 Site Geology and Meteorology

08 HYDROGEN
- 07 By-Products
- 09 Environmental Aspects
- 06 Industrial and Commercial Use
- 04 Marketing and Economics
- 01 Production
- 08 Properties
- 05 Safety
- 02 Storage
- 03 Transport

44 INSTRUMENTATION
- 03 Miscellaneous Instruments
- 02 Radiation Effects on Instrument Components, Instruments, or Electronic Systems
- 01 Radiation Instrumentation
- 04 Well Logging Instrumentation

07 ISOTOPE AND RADIATION SOURCE TECHNOLOGY
- 03 Isotopic Power Supplies
- 01 Physical Isotope Separation
- 02 Radiation Sources

36 MATERIALS
- 02 Ceramics, Cermets, and Refractories
- 03 Composite Materials
- 01 Metals and Alloys
- 06 Other Materials
- 04 Polymers and Plastics

03 NATURAL GAS
- 09 Artificial Stimulation, Plowshare, etc.
- 40 Combustion
- 03 Drilling, Production, and Processing
- 08 Environmental Effects
- 02 Geology and Exploration
- 05 Health and Safety
- 06 Marketing and Economics
- 10 Policy, Legislation, and Regulation
- 04 Products and By-Products
- 30 Properties
- 01 Reserves
- 50 Storage
- 20 Transport, Pipelines, and Handling
- 07 Waste Management

05 NUCLEAR FUELS
- 06 By-Products
- 05 Enrichment
- 30 Environmental Aspects
- 02 Exploration
- 04 Feed Processing
- 07 Fuels Production and Properties
- 40 Health and Safety
- 10 Marketing and Economics
- 03 Mining
- 50 Regulations
- 01 Reserves
- 08 Spent Fuels Reprocessing
- 09 Transport and Storage
- 20 Waste Management

21 NUCLEAR POWER PLANTS
- 08 Economics
- 06 Power Reactors, Auxiliary, Mobile, Package, and Transportable
- 05 Power Reactors, Breeding
- 03 Power Reactors, Non-Breeding, Graphite Moderated
- 01 Power Reactors, Non-Breeding, Light-Water Moderated, Boiling Water Cooled
- 02 Power Reactors, Non-Breeding, Light-Water Moderated, Non-Boiling Water Cooled
- 04 Power Reactors, Non-Breeding, Otherwise Moderated or Unmoderated
- 09 Process Heat Reactors
- 07 Regulation and Licensing

22 NUCLEAR REACTOR TECHNOLOGY
- 02 Components and Accessories
- 04 Control Systems
- 05 Environmental Aspects
- 03 Fuel Elements
- 07 Plutonium and Isotope Production Reactors
- 08 Propulsion Reactors
- 09 Reactor Safety
- 06 Research, Test, and Experimental Reactors
- 01 Theory and Calculation

04 OIL SHALES AND TAR SANDS
- 06 Direct Uses and By-Products
- 03 Drilling, Fracturing, and Mining
- 10 Environmental Aspects
- 07 Health and Safety
- 08 Marketing and Economics
- 04 Oil Production, Recovery, and Refining
- 05 Properties and Composition
- 20 Regulations
- 01 Reserves and Exploration
- 02 Site Geology and Hydrology
- 09 Waste Research and Management

09 OTHER SYNTHETIC AND NATURAL FUELS
- 02 Alcohol Fuels
- 06 Gaseous Waste Fuels
- 01 Hydrocarbon Fuels
- 03 Inorganic Hydrogen Compound Fuels
- 05 Liquid Waste Fuels
- 04 Solid Waste Fuels

43 PARTICLE ACCELERATORS
- 03 Auxiliaries and Components
- 02 Beam Dynamics, Field Calculations, and Ion Optics
- 01 Design, Development, and Operation
- 04 Storage Rings

02 PETROLEUM
- 50 Combustion
- 03 Drilling and Production
- 09 Environmental Aspects
- 02 Geology and Exploration
- 06 Health and Safety
- 07 Marketing and Economics
- 10 Policy, Legislation, and Regulation
- 04 Processing
- 05 Products and By-Products
- 30 Properties
- 01 Reserves
- 40 Storage
- 20 Transport, Pipelines, and Handling
- 08 Waste Management

64 PHYSICS RESEARCH
- 01 Astrophysics and Cosmology
- 02 Atmospheric Physics
- 03 Atomic, Molecular, and Chemical Physics
- 04 Fluid Physics
- 50 High Energy Physics

65 PHYSICS RESEARCH (CONT.)
- 90 Communication, Education, History, and Philosophy
- 80 Mathematical Physics
- 50 Medical Physics
- 10 Nuclear Physics
- 40 Radiation and Shielding Physics
- 60 Solid State Physics
- 70 Theoretical Physics

14 SOLAR ENERGY
- 03 Economics
- 04 Environmental, Legal, and Institutional Aspects
- 20 Heat Storage
- 08 Ocean Thermal Gradient Power Plants
- 06 Photovoltaic Power Plants
- 01 Resources and Availability
- 10 Solar Collectors and Concentrators
- 05 Solar Energy Conversion
- 09 Solar Radiation Utilization
- 07 Solar Thermal Power Plants

16 TIDAL POWER
- 04 Economics
- 05 Environmental Aspects
- 03 Regulations
- 07 Tidal Power Plants
- 08 Wave Energy Converters

17 WIND ENERGY
- 01 Availability (Climatology)
- 04 Economics
- 05 Environmental Aspects
- 03 Regulations
- 06 Wind Energy Engineering

CORPORATE AUTHOR INDEX

PERSONAL AUTHOR INDEX

SUBJECT INDEX

CONTRACT NUMBER INDEX

REPORT NUMBER INDEX

ORDER NUMBER CORRELATION

ENERGY RESEARCH ABSTRACTS

01 COAL AND COAL PRODUCTS

0104 Processing

REFER ALSO TO CITATION(S) 31725, 31746, 31746, 31907

31716 (DOE/PC/40778—T1) Optimization studies of various coal-conversion systems. Quarterly report Nos. 1 and 2, May 1, 1981-July 13, 1981 and August 1, 1981-October 31, 1981. Wen, C.Y.; Tong, T.; Huang, H.M.; Chen, H. (West Virginia Univ., Morgantown (USA). Dept. of Chemical Engineering). 1981. Contract FG22-81PC40778. 27p. NTIS, PC A03/MF A01. Order Number DE82005208.

Direct conversion of coal into coal liquids is usually carried out in a reactor composed of gas, solid and liquid. Two types of coal liquefier reactors are examined for the optimization of coal conversion systems: three-phase fluidized bed and bubble column of slurry reactors. These two reactors have some similarities, i.e., both are three-phase reactors, both deal with mass transfer of gas species from gas phase into liquid and solid phases and both involve dissolution of solid phase. The main difference between them is that solid particles have much longer residence time in three-phase fluidized beds than in bubble columns. The first part of this report is the literature survey of three-phase fluidization to clarify the hydrodynamic aspect of ebullated bed reactor design. The second part is the literature survey of the hydrodynamics of solid-liquid-gas system slurry reactors.

31717 (DOE/PC/40797—1) Study of multiphase flow useful to understanding scaleup of coal-liquefaction reactors. Technical progress report, September 1, 1981-November 30, 1981. Knickle, H.N. (Rhode Island Univ., Kingston (USA)). Dec 1981. Contract FG22-81PC40797. 8p. NTIS, PC A02/MF A01. Order Number DE82005438.

The major portion of the time spent on this project for this quarter involved specifying and ordering the equipment required to construct the 13 inch inside diameter column. The superstructure has been constructed in the laboratory and all major equipment has been ordered. In addition a series of dynamic gas disengagement experiments have been performed using the six inch inside diameter column. The major objective of these experiments was to determine whether the distribution has any effect on the bubble rise velocities. No major difference was found when the data for a porous plate and a sieve plate was compared.

31718 (MLM-MU—81-72-0002) Mass balance results for the Pricetown I underground coal gasification field test. Agarwal, A.K.; Seabaugh, P.W.; Zielinski, R.E. (Mound Facility, Miamisburg, OH (USA)). 1981. Contract AC04-76DP00053. 160p. NTIS, PC A08/MF A01. Order Number DE82005667.

A mass balance model was applied to the Pricetown I test data. This model provided values of various parameters such as water influx, percent devolatilization, percent gasification, amount of coal affected, thermal efficiency, etc., for the various phases of the test. Both hourly and daily values of the test data were used. At certain times, there was air loss to the coal seam or air gain from the coal seam as related to the underground reactor. Mass balances were modified accordingly. Realistic pyrolysis temperatures were chosen for the different phases of the test based on the thermocouple responses. The nitrogen and argon balances provided similar results. The mass balance results showed that approximately 702 tons of coal were affected during the test. Appoximately 266 tons of coal were completely gasified. The reverse combustion linkage through the virgin coal seam was dominated by the devolatilization and accounted for approximately 80% devolatilization whereas only 26% devolatilization occurred during the gasification phase. During the enhanced linkage phase, the percent devolatilization ranged between that observed for the RCL and gasification phase. There was a net influx of water which amounted to 0.59 barrels per ton of coal affected. The percent energy recovery for the gasification phase was 72% based on gas chromatographic data, and accounting for the sensible heat of the gas and the latent heat of the water vapor in the gas.

31719 (PNL-SA—9020) Radical pathways of coal dissolution in donor media during reactions of coals and specifically deuterated tetralin. Franz, J.A.; Camaioni, D.M. (Pacific Northwest Lab., Richland, WA (USA)). 1981. Contract AC06-76RL01830. 9p. (CONF-8104135—1). NTIS, PC A02/MF A01. Order Number DE82006085.

From American Chemical Society meeting; Atlanta, GA, USA (Apr 1981).

Recent studies utilizing deuterium labelling to trace the pathways of hydrogen transport between donor solvent, coal, and model compounds provided a detailed understanding of mechanistic pathways operating at the molecular level during coal dissolution in donor media. Deuterium scrambling in donor solvents constitutes a sensitive probe of the structural features of coal and mineral matter. In previous papers we presented detailed information concerning the time dependence of the structural distribution of deuterium transferred to a subbituminous coal at 427°C in tetralin-1,1-d_2. In a preliminary report of our recent studies of high temperature reactions of specific radicals in the tetralin and alkylindan systems we presented evidence that 2-tetralyl as well as 1-tetralyl radical is formed during the oxidation of tetralin to naphthalene. The evidence for the intermediacy of 2-tetralyl was the observation of scrambling of deuterium from the 1- to the 2-position of tetralin during reaction with coal. In this paper we present a study of the scrambling and depletion of deuterium in reactions of a bituminous and a subbituminous coal with tetralin-1,1-d_2. Radical and ionic pathways responsible for major differences in scrambling rates for the two coals are discussed.

31720 (UCID—19280) WIDCO mine coal face in-situ gasification test. Hill, R.W. (Lawrence Livermore National Lab., CA (USA)). 30 Dec 1981. Contract W-7405-ENG-48. 8p. NTIS, PC A02/MF A01. Order Number DE82005693.

A series of small tests have been carried out in an exposed coal face at the WIDCO mine. These tests called the Large Block Tests, have shown that the coal in the Big Dirty seam can be used to produce a high quality gas (140 Btu/scf air blown or 280 Btu/scf oxygen blown) with a thermal efficiency of 85 to 90% in a small (40 ton) burn. Larger scale tests will be needed to fully evaluate the potential for commercial use of in situ gasification with this coal. The purpose of this note is to describe a medium scale test that could be carried out at the same site as the Large Block tests at a similar cost. At the completion of this test, we should hae sufficient data to make a good assessment of the future potential for in situ gasification of the Big Dirty seam. The main goals for this test are: (1) to determine gas composition and thermal efficiency for a large enough burn to allow for the influence of roof collapse; (2) to test the CRIP concept of control by retracting the injection point; (3) to evaluate the problems of gas clean up for possible end use applications; (4) to gain additional experience to assess the commercial potential for gasification of the Big Dirty coal.

31721 Preparation of bimodal aluminas an molybdena/alumina extrudates. Tischer, R.E. (Pittsburgh Energy Technology Center, PA). *Journal of Catalysis;* 72: No. 2, 255-265(Dec 1981).

Methods for preparing bimodal alumina supports and molybdena/alumina catalysts by extrusion techniques were examined. The methods used to produce bimodal pore structure in the extrudates were (1) partial peptization, (2) coextrusion of salt/boehmite mixtures, and (3) incorporation of combustible fiber such as Avicel or filter pulp. The study was limited to Conoco's Catapal SB alumina. The effects of solid content of the mixture, pH of the peptizing solution, and degree of mixing on the consistency of the extrusion mixture and the pore size distribution of the resulting extrudates were examined. The type of cellulose fiber and its loading was found to affect the nature of the macropores produced in the extrudates. The extrudates were thermally treated to develop mesopores in the range needed for coal liquefaction catalysts (80 to 180 A with an average pore diameter of 120 A).

31722 **Hydrogenolysis of carbon and its catalysis by platinum.** Holstein, W.L.; Boudart, M. (Stanford Univ., CA). *Journal of Catalysis;* 72: No. 2, 328-337(Dec 1981).

The hydrogenolysis of carbon to methane and its catalysis by platinum were studied above and below 1050 K, respectively. Hydrogen pressure varied between ca. 10 and 100 kPa. At 890 K and atmospheric pressure, platinum accelerated the rate of the uncatalyzed reaction by a factor of 2000. Reaction orders with respect to H_2 and kinetic isotope effects in H_2 and D_2 suggest rapid equilibration of the carbon surface with hydrogen followed by a rate-determining step involving breaking of a carbon-carbon bond. This step appears to be a true hydrogenolysis step with direct participation of hydrogen in the uncatalyzed reaction. But with platinum, the rate-determining step seems to lead to the formation of a carbon-platinum bond with subsequent reaction of the carbidic carbon on platinum.

0106 Properties

REFER ALSO TO CITATION(S) 31719, 31747, 31828

31723 **(DOE/CS/40222—2) Hydration reactions of C_3A contained in an unusual flyash.** Diamond, S. (Purdue Univ., Lafayette, IN (USA)). 1980. Contract AS02-78CS40222. 4p. (CONF-8007127—1). NTIS, PC A02/MF A01. Order Number DE82007359.

From 7. international congress on the chemistry of cement; Paris, France (Jul 1980).

Flyashes produced from certain lignite and sub-bituminous coals have high contents of analytical CaO, presumably derived from limestone within the coal deposits. In the US a special category, Class C flyash has been designated for these materials. The mineralogy of the non-glassy portions of some of these flyashes is different from conventional flyashes, and in the material described C_3A, free lime, and anhydrite are all present. The flyash sets rapidly when mixed with water, and produces ettringite and C_4ASH_{12}. The unique spherical morphology of the flyash grains makes the morphological relationships between the hydration products and the unhydrated material unusually clear. The early reactions are similar to those of C_3A in portland cement, and the ash might serve as a useful model system for the study of the influence of various admixtures and other substances on C_3A reactions and setting behavior. Presumably ettringite and C_4ASH_{12} are also produced when flyashes similar to the one studied are incorporated in concrete, and their production should enhance early strength development.

31724 **(DOE/PC/30222—T2) Macromolecular structural changes in bituminous coals during extraction and solubilization. Quarterly technical progress report, 1 September 1981-1 December 1981.** Peppas, N.A. (Purdue Univ., Lafayette, IN (USA). School of Chemical Engineering). 1981. Contract FG22-80PC30222. 39p. NTIS, PC A03/MF A01. Order Number DE82004941.

Data are presented of the effect of coal pretreatment (extraction, flotation etc.) and porous structure on the apparent and effective swelling of several coals by four swelling agents. Analysis of the pore structure was achieved by mercury porosimetry and pyconometry. The effect of retained solvent in the pores is more prominent in the determination of the equilibrium coal volume fraction and the actual molecular weight between crosslinks, M/sub c/.

31725 **(DOE/PC/30230—23) Phase equilibrium properties of coal derived liquids. Technical progress report, July-December 1981.** Yesavage, V.F.; Kidnay, A.J. (Colorado School of Mines, Golden (USA). Dept. of Chemical and Petroleum Refining Engineering). 1 Jan 1982. Contract FG22-80PC30230. 21p. NTIS, PC A02/MF A01. Order Number DE82007006.

The objective of the present study is to measure equilibrium K values of coal derived liquids and model compounds representative of coal liquids, and to use the results in the development of engineering correlations. The program is divided into three major areas: (1) Design, construction, and evaluation of an equilibrium flash vaporization system for temperatures between 70 and 700°F, at pressures up to 2000 psia. (2) Measurements on samples of both coal derived liquids and mixtures of model compounds. (3) Preparation of engineering correlations for the measured K values and vapor liquid equilibria. On July 1, 1980, work was initiated on a program for experimental vapor liquid equilibrium measurements on coal derived liquids. During the last six months calibration of the pressure and temperature measuring equipment was completed. The system was tested for a single component system by reproducing the vapor pressure curve for pure water. Work was started on the water-ethanol binary system and one data point was obtained. These components were selected because reliable data for these components are available for comparison.

31726 **(DOE/PC/40793—T1) Predictors of plasticity in bituminous coals. Technical progress report No. 1.** Lloyd, W.G.; Reasoner, J.W.; Jiminez, A.; Hower, J.C.; Yates, L.P.; Jones, T.M. (Western Kentucky Univ., Bowling Green (USA); Kentucky Univ., Lexington (USA). Inst. for Mining and Minerals Research). 1 Dec 1981. Contract FG22-81PC40793. 57p. NTIS, PC A04/MF A01. Order Number DE82006195.

The first dozen coals - high volatile B and C from western Kentucky - have been identified and samples obtained. Classical analyses are nearly completed on this first group. Method development work has been undertaken and is substantially completed for pyrolysis gas chromatography, quantitative extraction of bitumen fraction, and isothermal plastometry. The principal item of new equipment, a Fourier transform infrared spectrometer, has been purchased and has been delivered. It is planned to acquire and to commence classical (ASTM and petrographic) characterization of the second dozen coals to be used, and to commence the systematic acquisition of isothermal plastometric data, GC pyrograms, and quantitative extractions. Development work will be initiated on the statistical analytical approaches to be used, with the expectation of commencing the first statistical analysis in May 1982.

0108 Waste Management

31727 **(EPRI-FP—671-Vol.3) State-of-the-art of FGD sludge fixation. Final report.** Duvel, W.A. Jr.; Gallagher, W.R.; Knight, R.G.; Kolarz, C.R.; McLaren, R.J. (Baker (Michael), Jr., Inc., Beaver, PA (USA)). Jan 1978. 269p. NTIS, PC A12/MF A01. Order Number DE82901830.

Thirty-one fully operational flue gas cleaning (FGC) electric utility lime/limestone and alkaline flyash wet scrubbing systems were evaluated to determine the practical significance of FGD sludge fixation. Five commercial sludge fixation installations are in operation. Other disposal practices are widespread and acceptable. Nine installations are landfilling wastes using various types of processing while seventeen are using ponding for dewatering and ultimate disposal. Of sixteen vendor companies evaluated, only two - IU Conversion Systems (IUCS) and Dravo Corporation - have demonstrated fully commercial capability. The other vendors have little or no FGD waste experience. Both IUCS and Dravo products exhibit lower permeability, greater strength, and overall improved physical, chemical, and engineering properties compared to untreated sludges. Dravo has one full-scale, 1650 Mw facility, IUCS has four installations totaling 1818 Mw. Estimated 30-year levelized incremental sludge fixation revenue requirements are $6.90 and $2.50 per dry ton of sludge solids for wet disposal (ponding) and dry disposal (landfilling), respectively. These costs are not highly site-dependent and can be applied generally. By-product recovery/utiliza-

tion concepts were found to be technically feasible but not economically competitive at this time. The most promising concepts are utilization of fixed sludge as a construction material, production of by-product gypsum with utilization in agriculture and wallboard manufacturing, and mine reclamation.

31728 **(LA—8826-PR) Trace element characterization of coal wastes. Fifth annual progress report, October 1, 1979-September 30, 1980.** Heaton, R.C.; Wangen, L.E.; Wanek, P.L.; Williams, J.M.; Thode, E.F.; Jones, M.M.; Nyitray, A.M.; Wagner, P.; Bertino, J.P. (Los Alamos National Lab., NM (USA)). May 1981. Contract W-7405-ENG-36. 109p. (EPA—600/7-81-087). NTIS, PC A06/MF A01. Order Number DE82010983.

During the past year we continued our research on environmental control technologies as they relate to coal preparation wastes and extended our assessments to include studies of high-sulfur Appalachian coal cleaning wastes. The most promising control technology for dealing with high-sulfur coal wastes consists of sequential slurry coating of the waste with lime and limestone. Co-disposal of coal wastes and alkaline soils or mine overburdens is partly effective in controlling the leachate quality under steady-state conditions. Comparisons between trace element concentrations predicted by chemical equilibrium models and those obtained in experiments with coal waste leachates yielded good agreements for the major cations (Al, Ca, Fe) but, except for fluoride, the major anions were not well accounted for. The observed trace element concentrations were all significantly lower than predicted. Calcination experiments have shown that high-sulfur coal waste from Appalachia (Plant K) behaves differently than other wastes we have studied. The high cost of this technology ($1.39 to $9.84/ton product) places it outside the realm of economic feasibility at this time. We have also completed an assessment of the Plant K coal wastes. These materials are similar to those from the Illinois Basin and their leachates are often very acidic, with pH values sometimes less than 2. Several trace elements have shown discharge severities greater than unity (Fe, As, Ni, Mn, Al), but iron is by far the worst offender, with values sometimes greater than 100. Results of the EPA Extraction Procedure, used to classify solid wastes under the Resource Conservation and Recovery Act, compare favorably with those of our own leaching experiments for those elements analyzed (Ag, As, Ba, Cd, Cr, Hg, Pb, Se). However, coal wastes release substantial quantities of other trace elements not included in the protocols at present (Fe, Al, Ni, Mn, Zn, Cu).

0109 Environmental Aspects

REFER ALSO TO CITATION(S) 31728, 31742, 31743, 31746, 31901, 32478, 32524, 32536, 32536, 32591, 32592

31729 **(PB—81-245011) Guide for revegetating coal mine-soils in the Eastern United States.** Vogel, W.G. (Forest Service, Broomall, PA (USA). Northeastern Forest Experiment Station). 1981. 198p. (GTR-NE—68). NTIS, PC A09/MF A01.

This report provides information, recommendations, and guidelines for revegetating land in the Eastern United States that has been disturbed by coal mining. Included are brief descriptions of major coal mining regions in the East, and a discussion of mine-soil properties and procedures for sampling, testing, and amending minesoils. Plant species that have been used for revegetating surface-mined lands are identified and described. Selection criteria for plant species and methods and requirements for seeding and planting are explained. Some of the data on tree species used in reforestation were obtained from recent surveys of 30-year-old experimental plantings in several Eastern States.

31730 **(PNL-SA—9806) Assessment of synfuel spill cleanup options.** Mercer, B.W.; Wakamiya, W.; Petty, S.E.; Strand, J.A.; Mahlum, D.D. (Pacific Northwest Lab., Richland, WA (USA)). 23 Jul 1981. Contract AC06-76RL01830. 15p. (CONF-8106109—5). NTIS, PC A02/MF A01. Order Number DE82005904.

From Workshop on processing needs and methodology for wastewaters from the conversion of coal, oil shale and biomass to synfuels; Germantown, MD, USA (Jun 1981).

This paper presents a preliminary assessment of the projected magnitude and impact of liquid synfuel spillage over the next 20 years and the effectiveness of conventional mitigation measures. Production levels were projected through the year 2000. By applying crude oil spill histories to these projections, estimates can be prepared for the quantities of synfuel products most likely to be spilled. The toxicity of the synfuels will depend on its density, composition, and physical properties and the environment in which it is spilled. Toxicological impacts of synfuel spills to the environment can be classified into 2 classes - acute and chronic and will be most severe in proximity to the spill site. Possible impacts to human populations are also discussed. (DMC)

0120 Mining

REFER ALSO TO CITATION(S) 32308, 32309, 32310, 32594, 32596.

31731 **(CONF-790273—(Vol3)) Colloquium on underground working and tunnelling.** Eichmeyer, H. (Technische Univ. Berlin (Germany, F.R.). Inst. fuer Bergbauwissenschaften). 1979. 339p. (In German). NTIS (US Sales Only), PC A15/MF A01. Order Number DE82901007.

From Colloquium on underground working and tunnelling; Berlin, F.R. Germany (8 Feb 1979).

This is the third proceedings volume of the Berlin colloquium on underground mining and tunnelling. Separate abstracts have been prepared for items within scope for inclusion in the Energy Data Base. There are 10 papers and a panel discussion dealing with various problems of technical development, planning, research, and academic training in the wide field of underground mining and tunnelling.

31732 **(DOE/ET/13354—T1) Cross-ridge mountaintop mining. Subphase III-X. Technical progress report, June 1, 1979-January 31, 1980.** Lappi, R.L. (Mathtech, Inc., Princeton, NJ (USA)). Feb 1980. Contract AC22-76ET13354. 118p. NTIS, PC A06/MF A01. Order Number DE82005246.

A search for a cooperating coal company and an appropriate mining site for a demonstration of cross-ridge mountaintop mining is discussed. The characteristics of the selected site and a proposed demonstration program are presented.

31733 **(DOE/FE/00080—2) Longwall data bank. Semiannual project report, May 28-November 28, 1981.** (Bituminous Coal Research, Inc., Monroeville, PA (USA)). Dec 1981. Contract AC01-81FE00080. 90p. NTIS, PC A05/MF A01. Order Number DE82005090.

This is the first semiannual report on Contract No. DE-AC01-81FE00080 entitled Longwall Data Bank. The objectives of the program are to compile and transfer to the coal industry comprehensive longwall operational data representing 95 percent of the US longwall installations and to provide abstracts of domestic and foreign literature published since 1975 related to longwall production, productivity, and dust control. The number of longwall faces operating in the US is steadily increasing, but their full production potential has not been achieved due to problems such as respirable-dust control, excessive move time, roof control, etc. Generally, longwall operators are not knowledgeable of operational data for longwall operations other than their own, nor of results from current longwall research. Therefore, the purpose of this program is to establish more effective technology-transfer procedures. The literature search was completed, except for an ongoing review of weekly abstract publications. Working cards were completed for the comprehensive index file for all longwall publications of interest; abstracts were prepared for selected longwall publications. Revised questionnaire forms, with information from the original questionnaires, were forwarded for updating to nearly all companies presently in the questionnaire file. Selected operational data were tabulated and compared.

31734 **(FMA-BM—8148-81) Technical progress report No. 5, December 1-December 31, 1981.** (Foster-Miller Associates, Inc., Waltham, MA (USA)). Dec 1981. 7p. Foster-Miller Associates, Inc., 350 Second Ave., Waltham, MA 02154.

FMA returned to Emery's Deer Creek Mine for the first evaluation of stage loader dust control techniques. Included in the two-week demonstration plan was the evaluation of the following dust controls: The Donaldson water powered (J-SAM) scrubber (installed on the stage loader); existing stage loader dust controls; and additional dust controls installed during the demonstration. Wing and gob curtain tests were planned during production downtime when scrubber evaluation was not possible. Dust sampling and ventilation mapping was performed with the scrubber and existing water sprays. Preliminary analysis of the data indicated a significant reduction in dust levels at the headgate operator's position and in overall intake contamination. However, dust was still escaping from the mouth of the crusher. A hood constructed of brattice cloth and additional sprays directing the airflow into the crusher were installed at this time. Dust sampling and ventilation mapping continued with all of the dust controls in operation. Additional reductions in dust levels were realized. The system was well received by Emery personnel for its practicality and visual impact on dust levels in the headgate. During the entire evaluation period, roof conditions were deteriorating rapidly, making data collection extremely hazardous. A roof fall in the headgate ultimately terminated the demonstration one day early.

31735 **(NP—2901005) Black coal. Data and trends 1978/79.** (Gesamtverband des Deutschen Steinkohlenbergbaus, Essen (Germany, F.R.)). Oct 1979. 43p. (In German). NTIS (US Sales Only), PC A03/MF A01. Order Number DE82901005.

Pictures illustrate the major developments on the energy sector, especially in coal mining, and the characteristic figures and data.

31736 **(NP—2901051) Coal mining in the West German power industry 1979.** (Statistik der Kohlenwirtschaft e.V., Essen (Germany, F.R.)). Sep 1980. 109p. (In German). NTIS (US Sales Only), PC A06/MF A01. Order Number DE82901051.

Tables are presented with figures on black coal mining, brown coal mining, coal balances, energy consumption, reserves, foreign trade, and energy balances. World surveys in the appendix inform on coal, petroleum, and natural gas production, electric power and raw steel production - according to country and year.

31737 **(DOE-tr—249) Recent findings in the sinking of shafts using rod-less shaft boring machines.** Wollers, I.K.; Bruemmer, K.H. Translated from *Glueckauf ;* **114**: No. 13, vp(1978). Contract W-31-109-ENG-38. 11p. NTIS, PC A02/MF A01. Order Number DE82002544.

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The shaft sinking technique using rod-less shaft boring machines was developed under a study group of specialist mining concerns - Thyssen Schachtbau GmbH, Deilmann-Haniel GmbH and Wirth Maschinen- und Bohrgeraete- Fabrik GmbH. The rod-less pit boring machine GSB 450/500, regarded as the predecessor to the shaft boring machine, has been tested over a bore hole length of more than 2,1 km. The SB VI-500/650 E/Sch shaft boring machine used for the first time to sink the pit in the Preussag AG Konle Ibbenbueren East Field coal mine, has proved itself from the start, in the case of shaft sinking schemes previously carried out. Therefore the rod-less shaft boring method appears to be promising.

31738 **(DOE-tr—248) New findings gained in blind shaft boring at the Zollverein mine.** Peters, T.E. Translated from *Glueckauf ;* **110**: No. 16, 647-655(1974). Contract W-31-109-ENG-38. 19p. NTIS, PC A02/MF A01. Order Number DE82002537.

Portions of document are illegible.

After using the blind shaft boring machine GSB-450/500 from A. Wirth and Co. KG twice in relatively mild rock formations, the sinking of the bored blind shaft at the Zollverein mine furnished the proof that even with the reconsructed prototype of this machine, boring rates of up to 19.5 m/d, with average rates around 10 m/d, could be achieved in hard, abrasive rock. Downtimes during the boring operations were attributable mainly to the high degree of wear of the cutting rollers, due, in part, to the high content of sandstone and, in part, to the secondary crushing of the cuttings on the borehole bottom, as well as by leaks in the hydraulic system of the shaft boring machine. The costs of the bored blind shaft are compared to the costs of a conventionally sunk blind shaft of the same depth, standing in the same geological formation, but having a diameter 0.25 m larger than the bored blind shaft. The additional cost of DM 226,000 of producing a bored blind shaft versus a conventionally sunk one is, at 10% of tota costs, still relatively low. In view of certain cost-reduction possibilities, a minimization of the cost difference in favor of the bored shaft can be expected.

0130 Transport And Handling

31739 **(DOE/TIC—2006853) Atomization characteristics of coal slurries. First quarterly report, September 1-November 30, 1981.** Krishna, C.R.; Marnell, P.; Butcher, T. (Brookhaven National Lab., Upton, NY (USA)). 1981. 12p. NTIS, PC A02/MF A01. Order Number DE82006853.

The purpose of this study is to understand atomization of coal-water mixtures. The work is broken down into several tasks which will be accomplished over a period of two years. The tasks include: (1) selected review of solid-liquid mixture flow properties relevant to atomization and an update of slurry atomization review; (2) measurement of drop size characteristics of coal-water mixtures as a function of the key atomizer parameters for an air atomizer; (3) analysis and correlation of the data; and (4) preparation of a final report summarizing the results of the work. The work done in this period included: (1) modification of the atomizer test rig; (2) measurments using water; (3) measurements using a low coal concentration coal-water mixture; and (4) a continuing review of slurry atomization literature. Description of the work is provided in this report.

0140 Combustion

REFER ALSO TO CITATION(S) 31739

31740 **(DOE/PC/30216—T3) Characteristics of coal/light hydrocarbon slurries in spray combustion. Quarterly progress report, September 1, 1981-November 30, 1981.** Grosshandler, W.L.; Crowe, C.T.; Chung, J.N. (Washington State Univ., Pullman (USA). Dept. of Mechanical Engineering). Dec 1981. Contract FG22-80PC30216. 17p. NTIS, PC A02/MF A01. Order Number DE82006294.

Research activities are summarized. Some progress on each of the three major tasks has been accomplished, but no new significant results have been obtained. A redesign of the spray facility is underway to give more reliable size distribution measurements. The numerical model is being expanded to include evaporation and combustion in both the high and low Reynolds number limits. Recent measurements of temperature within the opposed-flow diffusion burner are reported for air/propane mixtures. Attempts to measure coal particle velocity in cold flow tests are also discussed.

31741 **(DOE/PC/40270—3) Combustion enhancement and pollutant control research with acoustically induced mixing. Technical progress report, September 1981-December 1981.** Faeser, R.J.; Rudnicki, M.I. (Aerojet Energy Conversion Co., Sacramento, CA (USA)). Jan 1982. Contract AC22-81PC40270. 29p. NTIS, PC A03/MF A01. Order Number DE82007012.

An experimental research program has been initiated to evaluate the possibility that beneficial effects can result when acoustic energy is impressed on the combustion zone of pulverized coal furnaces. These benefits include the reduction in NO/sub x/ generation, the increase in combustion intensity, and the increase in turndown ratio (maximum flow/minimum flow). The postulated reason for these possible benefits is the increased relative motion of the gas and coal particles and the fine stirring action resulting from high frequency acoustic waves. During the third three-month period of this contract, the fabrication and checkout of the test fa-

cility were completed, combustion testing was initiated, and a more efficient location for the acoustic drivers was identified.

31742 **(DOE/PETC/TR—82/5) Final test report on the combustion of solvent-refined coal in a 100 hp firetube boiler.** Pan, Y.S.; Wieczenski, D.E.; Snedden, R.B.; Bellas, G.T.; Joubert, J.I.; Curio, A.R.; Wildman, D.J. (USDOE Pittsburgh Energy Technology Center, PA). 1982. 48p. NTIS, PC A03/MF A01. Order Number DE82007670.

Although solid Solvent-Refined Coal (SRC-I) was burned successfully in a coal-designed utility boiler in 1977, the feasibility of using this fuel in more compact oil- or gas-designed units at signficantly higher heat liberation rates remained uncertain. Combustion tests were conducted at the Pittsburgh Energy Technology Center using a 100 hp (3450 lb of steam per hour) firetube boiler, designed to burn No. 6 oil. The fuel was produced at an SRC pilot plant in Wilsonville, Alabama, from high-sulfur Kentucky coal, and 0.8% sulfur and 0.3% ash. In the combustion tests, SRC was fed to the boiler in three different physical forms: (1) a slurry composed of 70% by weight SRC-I process solvent and 30% by weight solid SRC pulverized to 92% minus 200 mesh; (2) a molten liquid at ~ 600°F, using superheated steam at 800°F for atomization, and preheated combustion air at 400°F in a conventional oil burner; and (3) a solid, pulverized to 90% minus 325 mesh, using preheated secondary combustion air at 550°F. The slurry and molten forms were burned at full boiler load at a heat liberation rate of 184,000 Btu/ft^3-hr. Carbon conversion efficiencies were generally 99.7% or greater, and boiler efficiencies were about 82%, the same as when burning No. 6 fuel oil. The pulverized SRC was burned at ~ 50% of full boiler load (1656 to 1803 lb of steam per hour) due to the limitations on the burner that was available. Carbon conversion efficiencies ranged from 98.6 to 99.6%, and boiler efficiency again was about 82%. The test results indicate that SRC-I, including the solid form, can probably be burned without derating in larger oil-designed industrial boilers of watertube design. Such units usually operate at heat liberation rates in the range of 25,000-50,000 Btu/ft^3-hr, significantly lower than rates employed in these tests.

31743 **Potential for use of peat blends with coal for electric power generation.** Anson, D.; Hazard, H.R.; Murin, J.M.; Honea, F.I. (Battelle, Columbus, Ohio). *American Society of Mechanical Engineers, [Paper]*; No. 81-JPGC-Fu-2, vp(Oct 1981).

The paper deals with the possible use of peat/coal blends in utility boilers. Two peat sources and three coals of different rank were studied under a DOE contract. From fuel and ash properties estimates were made of the changes from coal firing practice that would be required in boiler design and fuel preparation. Effects on boiler fouling, slagging and performance were predicted and compared with behavior and design of plants to operate on coal or pet alone. The paper gives information on European experience with peat firing, and on the current state of the art in the US. The design of 250 MW boilers to fire 50/50 peat/coal blends is discussed in terms of major dimensional parameters. 21 refs.

0150 Marketing And Economics

31744 **(FERC—0069) Status of coal supply contracts for new electric generating units.** (Federal Energy Regulatory Commission, Washington, DC (USA). Office of Electric Power Regulation). Mar 1981. 54p. NTIS, PC A04/MF A01. Order Number DE82007634.

This report is an update of a report first issued in 1977. It is based upon an informal survey of electric utility progress in contracting for coal supplies to serve the needs of new generating units under construction or planned. The report is one of a series of staff studies of factors and trends relevant to the Commission's electric power responsibilities. In recent years, the economics of fuel supply for electric power has become a regulatory issue of major concern.

31745 **Severance taxes on coal and uranium in the sunbelt.** Gillis, M.; Peprah, I. Austin, TX; Univ. of Texas (1981). 39p. Univ. of Texas, Bureau of Business Research, Austin, TX 78712 $5.00.

This report discusses recent developments in subnational severance taxes on coal and uranium in the Sunbelt states (Alabama, Arkansas, Arizona, California, Florida, Louisiana, Georgia, Kentucky, Oklahoma, Mississippi, New Mexico, North Carolina, Texas, Tennessee, South Carolina, and Virginia) and presents a brief evaluation of the likely impact of these taxes both on residents of energy-importing states and upon national energy aims in general. We have assumed that federal government objectives concerning the role of coal and uranium in satisfying future energy needs will continue to be those detailed in the October 1978 compromise energy package enacted by Congress and signed by President Jimmy Carter and outlined by the president in a series of energy policy pronouncements in 1979 and 1980.

0160 Health And Safety

REFER ALSO TO CITATION(S) 32536

31746 **(DOE/ET/14746—1) Assessment of health, safety and environmental impacts of DOE coal conversion process. First technical progress report, 2 July 1980-31 March 1981.** Bratina, J.E.; Fillo, J.P.; Vance, S.W.; Wong-Chong, G.M. (Carnegie-Mellon Inst. of Research, Pittsburgh, PA (USA); Environmental Research and Technology, Inc., Pittsburgh, PA (USA)). Oct 1981. Contract AC01-80ET14746. 100p. NTIS, PC A05/MF A01. Order Number DE82006826.

Highlights of activities completed during the quarter are summarized in this report. The management plan developed by CMIR-ERT is outlined. The technical reports Solvent Refined Coal (SRC-II) technology: Material for Environmental and Health Characterization and Water/Wastewater Management in Coal Conversion Processes are included. The former report provides insight into the technical issues to be addressed in environmental and health programs for synfuel facilities. In the latter report management alternatives are offered which comply with regulatory and economics constraints. Experience gained in allied industries is used to support the discussion. The experimental equipment and proposed operating conditions at CMIR are described and the scope of the work is discussed. The 3 major subsystems of the riser (entrained flow gasifier) PDU system are presented. The subsystems included are: (1) the solid and gas feed system; (2) the riser gasifier; and (3) the product separation system. The Phenol Decomposition Bench-Scale Reactor is also described. (DMC)

31747 **(PNL-SA—8813) Chemical/biological characterization of SRC-II product and by-products.** Felix, W.D.; Mahlum, D.D.; Weimer, W.C.; Pelroy, R.A.; Wilson, B.W. (Pacific Northwest Lab., Richland, WA (USA)). 1980. Contract AC06-76RL01830. 24p. (CONF-8009103—2). NTIS, PC A02/MF A01. Order Number DE82005912.

From Symposium on environmental aspects of fuel conversion technology; St Louis, MO, USA (Sep 1980).

The purpose of this paper is to discuss the method and approaches used at the Pacific Northwest Laboratory in providing chemical and biological data dealing with Solvent Refined Coal (SRC) materials. The approach is designed to provide meaningful health data to the technology developers within the time frame which permits technology changes to be made optimally to ameliorate potential problem areas. Chemical and biological characterization studies have included: gas chromatography; gas chromatography/mass spectroscopy; liquid chromatography/mass spectroscopy; specialized separations; microbial mutagenesis assays; in vitro mammalian cell toxicity and transformation assays; epidermal carcinogenesis; acute and subchronic oral toxicity; developmental toxicity; dominant lethal assays; inhalation toxicity; dosimetry and metabolism studies.

02 PETROLEUM

31748 **(NP—2901046) Business report 1979.** (Esso A.G., Hamburg (Germany, F.R.). Hauptabteilung fuer Umweltschutz). [nd]. 41p. (In German). NTIS (US Sales Only), PC A03/MF A01. Order Number DE82901046.

The structure and activities of one of the largest undertakings in the petroleum industry is described in the form of a report from the board of directors. Furthermore, the final report 1979 is

explained and the annual balance and profit and deficit calculation are given.

0202 Geology And Exploration

31749 **(CONF-8103124—Absts) Twelfth annual Appalachian Petroleum Geology Symposium. Appalachian thrust belt/tight sands/shale gas. Circular No. C-20.** (West Virginia Geological and Economic Survey, Morgantown (USA)). 1981. 74p. Director, State Geologist, Mount Chateau, Mont Chateau Rd., P.O. Box 879, Morgantown, WV 26505 $6.00.

From 12. annual Appalachian petroleum geology symposium; Morgantown, WV, USA (17 Mar 1981).

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Abstracts of 19 papers presented at the Symposium on Appalachian Thrust Belt/Tight Sands/Shale Gas are presented. In addition, the program of the Symposium, and oil and gas drilling statistics for West Virginia during 1980 are presented. (ATT)

31750 **(LA—8983) Synthesis of hydrocarbons in the earth's crust.** Vanderborgh, N.E. (Los Alamos National Lab., NM (USA)). Nov 1981. Contract W-7405-ENG-36. 6p. NTIS, PC A02/MF A01. Order Number DE82007356.

This report suggests an alternative theory for the generation and migration of petroleums. Considerable evidence supports the conclusion that life processes persist deep within terrestrial and marine environments. Such in vivo processes may survive in photon-free ecologies using mechanisms that both reduce carbon dioxide and oxidize sulfides. These in vivo conversions create petroleums.

0203 Drilling And Production

REFER ALSO TO CITATION(S) 32596

31751 **(NP—2901091) Market for drilling rigs (petroleum, natural gas).** (Bundesstelle fuer Aussenhandelsinformation, Koeln (Germany, F.R.)). Mar 1980. 51p. (In German). NTIS (US Sales Only), PC A04/MF A01. Order Number DE82901091.

This is a market analysis based on data which represent the situation of November 1979. In 1980 a rise in drilling activities for petroleum and natural gas can be expected, especially in USA and Canada. The profits of the firms which deal with the sectors of drilling rigs, services, and drilling activities both in the offshore area and ashore will thus show positive developments. Most probably the stagnation of offshore drilling rig construction is going to last for a while.

31752 **Steel in offshore structures.** Sandmann, F. *Stahl und Eisen;* **101**: No. 21, 55-62(19 Oct 1981). (In German).

From 13. annual conference of the International Iron and Steel Institute; Toronto, Canada (12 - 14 Oct 1981).

Offshore equipment for exploration, production and transportation of oil is described. Requirements of production platforms, capital and steel for 1984 are forecast. Technical demands on offshore steels are specified, above all weldability, hardness in the heat affected zone, resistance to lamellar tearing for semi-submersibles and fatigue strength of the nodes. Substitution of steel by concrete and future chances of the application of steel are considered.

0206 Health And Safety

REFER ALSO TO CITATION(S) 32051

0207 Marketing And Economics

REFER ALSO TO CITATION(S) 31751

31753 **(NP—2901054) Mineral oil and employment. Jobs in the West German mineral oil industry and its secondary industries.** (Mineraloelwirtschaftsverband e.V., Hamburg (Germany, F.R.)). [nd]. 16p. (In German). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82901054.

The main aspect of the investigation is the number of working places which are directly connected with the mineral oil supply. The variety of connections and interdependences has to be pointed out for demonstrating the importance of the mineral oil industry for working places. Even if there is a strong limitation, nearly one person of 100 has an employment in this industry, which means about 225,000 employees working in the fields of exploration, chemical treatment, distribution and transportation of crudes and derivatives.

0209 Environmental Aspects

REFER ALSO TO CITATION(S) 31892

0210 Legislation And Regulation

31754 **(NP—2901180) 1980 Legal Report of Oil and Gas Conservation Activities.** (Interstate Oil Compact Commission, Oklahoma City, OK (USA)). Oct 1981. 34p. NTIS, PC A03/MF A01. Order Number DE82901180.

Legal activities which have taken place throughout the US and Canada during 1980 in the oil and gas industries are reported. The report includes legislative, administrative, and judicial articles from twenty-nine states and the Canadian provinces of Alberta and British Columbia.

0230 Properties

REFER ALSO TO CITATION(S) 31764, 31765, 31828

31755 **Distillate-fuel stability and cleanliness.** Stavinoha, L.L.; Henry, C.P. (eds.). Philadelphia, PA; American Society for Testing and Materials (1981). 169p. (ASTM-STP—751; CONF-8006225—). American Society for Testing and Materials, 1916 Race St., Philadelphia, PA 19103.

From American Society for Testing and Materials symposium on petroleum products and lubricants; Chicago, IL, USA (24 Jun 1980).

A symposium was held in June 1980 to assess the state of the art and to define current and future needs for tests to predict and monitor the stability and cleanliness of distillate fuels (excluding aviation turbine fuels). Topics included appraisals of present-day distillate fuel stability and cleanliness, requirements for various applications, anticipated trends, future fuels, fuel distribution problems, microbiological contamination, test methods for stability and cleanliness, and refinery processes which improve stability. This publication contains the twelve papers that were presented at the Symposium. All papers have been abstracted and indexed.

31756 **Accelerated stability test techniques for middle distillate fuels.** Stavinoha, L.L.; Westbrook, S.R. (Southwest Research Inst., San Antonio, TX). *American Society for Testing and Materials, Special Technical Publication;* No. 751, 3-21(1981). (ASTM-STP—751; CONF-8006225—). Contract AC19-79BC10043.

From American Society for Testing and Materials symposium on petroleum products and lubricants; Chicago, IL, USA (24 Jun 1980).

Improved test techniques are needed for evaluating the inherent stability of middle distillate fuels both in surveillance and in procurement activities. A project was initiated to define and evaluate the contributing conditions leading to the formation of deleterious products in accelerated aging tests of middle distillate fuels and to relate these results to an experimental definition of more repeatable/reliable middle distillate fuel stability test technique(s). A literature search was conducted to provide a list of stability test techniques and their interpretations which could be used in a correlative middle distillate fuel stability test program. For this program, seven accelerated stability tests were chosen and evaluated using a set of six test fuels. The test techniques were selected to represent a wide variety of test conditions, including temperature, aging time, and oxygen availability. These six test fuels were purposely chosen to represent a wider range of stabilities than would necessarily be

commonly available for procurement. The fuel properties generally measured included both adherent and suspended particulates, steam jet gum, color, and light absorbance at 540 nm. Accelerated stability test results were then related to test results obtained at a storage temperature of 43.3°C, which has generally been regarded as showing good correlation with long-term ambient storage.

31757 **du Pont F21 149°C (300°F) accelerated stability test.** Henry, C.P. (E.I. du Pont de Nemours & Co., Inc., Wilmington, DE). *American Society for Testing and Materials, Special Technical Publication;* No. 751, 22-33(1981). (ASTM-STP—751; CONF-8006225—).

From American Society for Testing and Materials symposium on petroleum products and lubricants; Chicago, IL, USA (24 Jun 1980).

The du Pont F21 149°C (300°F) Accelerated Stability Test has been used for many years to monitor stability properties of distillate fuels. The test (or variations of it) is the most commonly used in the petroleum industry because, of the many tests available, it is easiest to carry out. A small fuel sample is heated to 149°C (300°F) for 90 min or more, cooled, and filtered; degradation is qualitatively determined by visual or instrumental evaluation of the filter pad - without the need for gravimetric procedures. In our laboratory it is usually the first of several tests to evaluate fuel stability; results guide further work. The test is also used to monitor fuel stability during production, distribution, and storage. Variations, refinements, applications, and limitations of the test are discussed. Severity is modified by varying the 149°C (300°F) aging period from 90 min to 4 1/2 h. Sensitivity is varied by changing the porosity of the filter paper. Test results are precisely rated by measuring filter pad light reflection. The reproducibility of the test is considered, along with factors which affect results. Data are presented which show the relationship of test results with actual long-term storage stability of fuels.

31758 **Correlation of long-term storage and accelerated stability tests.** Garner, M.Q.; White, E.W. (David Taylor Naval Ship R & D Center, Annapolis, MD). *American Society for Testing and Materials, Special Technical Publication;* No. 751, 34-46(1981). (ASTM-STP—751; CONF-8006225—).

From American Society for Testing and Materials symposium on petroleum products and lubricants; Chicago, IL, USA (24 Jun 1980).

Three-year outdoor bottle and column storage tests described in ASTM STP 531 have been completed on four Navy distillate fuels. The total insolubles were linear functions of the time in storage in both the bottle tests and in the accelerated 43.3°C (110°F) beaker tests. About the same amount of new total insolubles formed in one week of beaker storage as formed in one month of bottle storage at an effective temperature of 19°C (67°F). The stability ranking of the four fuels was essentially the same regardless of which test was used and regardless of whether total insolubles or the rate at which additional insolubles were formed was used as the basis of the ranking. The geographic location for outdoor bottle tests was an important factor and was probably related to the average annual temperature at the location.

31759 **Fuel oil distributor's experience with contaminated No. 2 fuel oil.** Stieber, A. (S. Albert Co. Ltd., Montreal, Quebec); Kallio, N.N. *American Society for Testing and Materials, Special Technical Publication;* No. 751, 47-59(1981). (ASTM-STP—751; CONF-8006225—).

From American Society for Testing and Materials symposium on petroleum products and lubricants; Chicago, IL, USA (24 Jun 1980).

This presentation is largely a documentation of events that took place in Montreal when a major fuel oil distribution company inadvertently received contaminated fuel oil from a refinery and delivered it to a large number of customers, many of whom experienced operational problems. The contaminants were mostly salt (sodium chloride), sediment, and moisture, and the operational problems revolved around damage to the customer's fuel systems, principally corrosion of fuel pumps, leading to malfunction and failure. Many fuel line filters were also plugged by sediment, principally rust. Steps were then taken to repair the customer's contaminated and damaged fuel systems; to remove all traces of contaminants from the company distribution system; and, in the future, to monitor on a daily basis by laboratory tests the quality of fuel received from the refinery. In particular, a simple conductivity device was built and used to test newly delivered fuel for the presence of conducting contaminants, such as salt and water.

31760 **Navy needs and experience with distillate fuel stability and cleanliness.** Boyle, J.F. (Naval Ship Systems Engineering Station, Philadelphia, PA); Layne, R.P.; McGee, T.; White, E.W. *American Society for Testing and Materials, Special Technical Publication;* No. 751, 60-75(1981). (ASTM-STP—751; CONF-8006225—).

From American Society for Testing and Materials symposium on petroleum products and lubricants; Chicago, IL, USA (24 Jun 1980).

Navy shipboard fuels are subjected to an environment, combat reliability requirements, and occasionally long-term storage that impose stability and cleanliness needs not normally required for fuels for shore use. The Navy satisfies those needs through specifications imposing more constraints than similar American Society for Testing and Materials (ASTM) specifications, through a strict inspection system, and through quality testing at various steps in the acquisition and distribution system. This Navy quality-control system is described. Statistical data based upon inspection data from a random sampling of fuel acquired between February 1977 and January 1980 are presented. Results of an extensive survey of fuel received and used by one class of ships which bunkered at ports around the world are given. Data include the amount, nature, and size of particulate matter, as well as the contents of water, sodium, and copper.

31761 **Army needs for diesel fuel stability and cleanliness.** Stavinoha, L.L. (Southwest Research Inst., San Antonio, TX); Westbrook, S.R.; LePera, M.E. *American Society for Testing and Materials, Special Technical Publication;* No. 751, 103-125(1981). (ASTM-STP—751; CONF-8006225—).

From American Society for Testing and Materials symposium on petroleum products and lubricants; Chicago, IL, USA (24 Jun 1980).

This paper reviews the general topic of fuel deterioration. Primary emphasis is on diesel fuels used in compression ignition engines, which power the majority of Army tactical and combat vehicles. Field problems regarding the fuel stability and related problems are summarized, and the status of on-going research and development programs is outlined. This information places in perspective the background which has prompted current research activities to detect, predict, and prevent fuel stability-associated equipment failures. Concern for anticipating deleterious product formation in current and future fuel formulations composed of diverse petroleum crude and synthetic (shale or coal) crude oils, fuel/equipment interactions, diverse storage conditions, and the increased desire for prolonged storage periods provides the driving factors in defining the Army's fuel stability research programs. While placing these concerns in perspective, the Army's present and future needs for diesel fuel stability and cleanliness control are identified.

31762 **Microbial contamination of ship fuels.** Neihof, R.A. (Naval Research Lab., Washington, DC); Klemme, D.E.; Patouillet, C.E.; Hannan, P.J. *American Society for Testing and Materials, Special Technical Publication;* No. 751, 126-135(1981). (ASTM-STP—751; CONF-8006225—).

From American Society for Testing and Materials symposium on petroleum products and lubricants; Chicago, IL, USA (24 Jun 1980).

A laboratory evaluation has been made of water-soluble biocides which might be effective in controlling microbial contamination in water-compensated fuel storage tanks on naval ships. Higher concentrations of biocides were generally required for control of sulfate-reducing bacteria in steel drums simulating ships' tanks than in test-tube scale assays. At least tenfold higher concentrations were necessary when biocide additions were made after, rather than before, bacterial growth had developed extensively. A mercaptopyridine biocide was effective at the lowest concentration followed by methylene bisthiocyanate and a triazine derivative; an organoboron compound was comparatively ineffective. Attention has also been given to the possible environmental impact of discharging bio-

cide-treated water. An algal assay has been used to study the loss in toxicity of candidate biocides in seawater solution on exposure to sunlight. The mercaptopyridine biocide was particularly susceptible to photodegradation. Thus it may be possible to control microbial contamination indefinitely in a dark fuel tank with a biocide which photodegrades to nontoxic products when discharged into sunlit surface waters.

31763 **Microbiological contamination of fuels during storage.** Littmann, E.S. (Nalco Chemical Co., Sugar Land, TX). *American Society for Testing and Materials, Special Technical Publication;* No. 751, 136-144(1981). (ASTM-STP—751; CONF-8006225—).

From American Society for Testing and Materials symposium on petroleum products and lubricants; Chicago, IL, USA (24 Jun 1980).

Microorganism growth during hydrocarbon storage is a well-recognized problem. The most easily detected problem is fuel filter plugging, particularly in aviation fuels. Other problems include degradation of hydrocarbon quality, corrosion of storage tanks, and concentration of hazardous or toxic growth by-products in the water associated with the storage. Particular problems and the growth of the microorganisms creating them are discussed. The discussion also includes methods for detection and quantitation of the troublesome organisms and philosophies for control of the microorganism growth.

0240 Storage

REFER ALSO TO CITATION(S) 31755, 31756, 31757, 31758, 31761, 31762, 31763

31764 **Stabilization of No. 2 fuel oils with caustic treating and additives.** Powers, E.J.; Wotring, W.T. (Standard Oil Co., Cleveland, OH). *American Society for Testing and Materials, Special Technical Publication;* No. 751, 92-102(1981). (ASTM-STP—751; CONF-8006225—).

From American Society for Testing and Materials symposium on petroleum products and lubricants; Chicago, IL, USA (24 Jun 1980).

A combination of caustic treating and additives is used in the refinery to stabilize No. 2 distillate fuels to prevent the formation of insoluble gum and color degradation in long-term ambient storage. Cracked components are treated with caustic to remove reactive compounds such as thiophenols. Straight-run components are not treated. Blends of treated cracked components and untreated straight-run components can be further stabilized with commercial additives to limit insoluble gum formation to 2 mg/100 cm^3 after storage for 16 weeks at 43.3°C.

31765 **Storage stability trends for distillate fuels: panel discussion.** *American Society for Testing and Materials, Special Technical Publication;* No. 751, 145-156(1981). (ASTM-STP—751; CONF-8006225—).

From American Society for Testing and Materials symposium on petroleum products and lubricants; Chicago, IL, USA (24 Jun 1980).

Panel members were asked to prepare brief comments on past, present, and future distillate fuel stability trends, then participate in a general discussion of stability and cleanliness. Prepared comments do not necessarily represent a complete consideration of problems and trends - the purpose was to provide a basis for general discussion leading to consensus on needs which should be addressed by ASTM efforts. Overall, comments and discussion led to agreement that, while distillate fuel in the marketplace has generally acceptable stability and cleanliness, less-stable fuels are being produced than in the recent past. Potential use of nonpetroleum-derived fuels increases concerns. Test methods, especially for quality control, are not available which are broadly accepted by the industry, and ASTM efforts to develop standardized methods would be appropriate.

0250 Combustion

REFER ALSO TO CITATION(S) 31740

31766 **Soot volume fraction profiles in a free combusting boundary layer.** Beier, R.A.; Pagni, P.J. (Lawrence Berkeley Lab, Calif). *American Society of Mechanical Engineers, [Paper];* No. 81-HT-1, vp(Aug 1981).

Carbon particulate volume fraction profiles and approximate particle size distributions are measured in a free laminar combusting boundary layer for several liquid hydrocarbon fuels and PMMA (polymethylmethacrylate). A multiwavelength laser transmission technique determines a most probable particle radius and a total particle concentration, which are the two unknown parameters in an assumed Gauss size distribution. In the combusting boundary layer, a sooting region exists between the pyrolyzing fuel surface and the flame. 29 refs.

03 NATURAL GAS

31767 **(NP—2901045) Annual report on the 54th year of business 1979.** (Ruhrgas A.G., Essen (Germany, F.R.)). 1979. 65p. (In German). NTIS (US Sales Only), PC A04/MF A01. Order Number DE82901045.

Structure and activities of this large German gas supply company are described presenting the report of the executive board, the explanations on the annual balance for 1979, and the report of the supervisory board. The balance for 1979 and the profit and loss account are presented as annexes.

0302 Geology And Exploration

REFER ALSO TO CITATION(S) 31749

31768 **(DOE/BC/10003—19) Shallow unconventional gas applications study. Final report.** (CER Corp., Las Vegas, NV (USA)). May 1981. Contract AC08-79BC10003. 254p. NTIS, PC A12/MF A01. Order Number DE82005849.

The Shallow Unconventional Gas Application Study (SUGAS) was undertaken to determine the feasibility of developing shallow, low pressure, subcommercial gas resources found throughout large areas of the Northern Great Plains Province. The study incorporated geologic, technical, economic and institutional factors affecting development of the unconventional gas resource. This report details the results of the SUGAS study and can be used as a guide by individuals or communities interested in determining the utilization potential of shallow, low pressure gas resources in their area. The general conclusion is that shallow, low pressure, low deliverability gas resources in the Northern Great Plains Province can be developed in restricted locations where conditions are suitable. Project viability will be affected by: local geology, lease availability and acquisition costs, drilling and completion procedures and costs, transportation costs, financing availability and terms, regulatory and gas pricing controls, and the degree of perseverence, innovative thinking and dedication on the part of project participants.

0303 Drilling, Production, And Processing

REFER ALSO TO CITATION(S) 31751, 31896, 32596

0306 Marketing And Economics

REFER ALSO TO CITATION(S) 31751

0308 Environmental Effects

REFER ALSO TO CITATION(S) 31892

0309 Artificial Stimulation

REFER ALSO TO CITATION(S) 31768

31769 (DOE/ET/12074—T1) Fracture of Devonian shale by tailored pulse-loading. Final report, August 15, 1977-August 15, 1978. McHugh, S.L.; Murri, W.J.; Seaman, L.; Curran, D.R.; Keough, D.D. (SRI International, Menlo Park, CA (USA)). Dec 1978. Contract AT03-76ET12074. 94p. NTIS, PC A05/MF A01. Order Number DE82004536.

The Department of Energy (DOE), Morgantown Energy Technology Center (METC) at Morgantown, West Virginia, is examining methods to increase production of natural gas from marginal reserves. Because of the potentially large reserves present in the eastern Devonian shales, these materials have been selected for the application and evaluation of novel and existing well fracturing and simulation techniques. As part of this program, SRI International has studied the feasibility of enhancing fracture formation and growth in well stimulation by tailored pulse loading, i.e., shaping the borehole input pressure-time history to produce a specified fracture pattern. Specifically, SRI's computational fracture model, NAG-FRAG, was used to evaluate the effect of pulse shape and rock properties in controlling dynamic rock fracture. Preliminary calculations were made of the amount and location of damage in a cylindrical configuration, and laboratory-scale springing experiments were performed to determine the NAG-FRAG fracture parameters of the Devonian shale. An exponentially decaying input pressure history was selected as the pulse shape for use in the final pulse shaping calculations.

31770 (DOE/ET/12074—T3) Fracture of Devonian shale by tailored pulse-loading. Quarterly progress report 2, January 1-March 31, 1978. McHugh, S.L.; Murri, W.J.; Seaman, L.; Curran, D.R.; Keough, D.D. . (SRI International, Menlo Park, CA (USA)). 31 Mar 1978. Contract AT03-76ET12074. 33p. NTIS, PC A03/MF A01. Order Number DE82002297.

This report describes SRI International's progress during the second quarter in a study of the feasibility of enhancing fracture formation and growth in well stimulation by tailored pulse loading. Flaw activation and growth concepts are used in SRI's fracture computational subroutine NAG-FRAG to describe the effects of tailored pulse loading on geologic materials. As a representative rock we are using Devonian shale furnished by the Illinois State Geological Survey (ISGS).

0310 Legislation And Regulation

REFER ALSO TO CITATION(S) 31754

0320 Transport, Pipelines, And Handling

31771 (BNL—30440) Systems analysis of hydrogen supplementation in natural gas pipelines. Hermelee, A.; Beller, M.; D'Acierno, J. (Brookhaven National Lab., Upton, NY (USA)). Nov 1981. Contract AC02-76CH00016. 12p. (CONF-811212—10). NTIS, PC A02/MF A01. Order Number DE82006933.

From 4. international conference on alternative energy sources; Miami Beach, FL, USA (14 Dec 1981).

The potential for hydrogen supplementation in natural gas pipelines is analyzed for a specific site from both mid-term (1985) and long-term perspectives. The concept of supplementing natural gas with the addition of hydrogen in the existing gas pipeline system serves to provide a transport and storage medium for hydrogen while eliminating the high investment costs associated with constructing separate hydrogen pipelines. This paper examines incentives and barriers to the implementation of this concept. The analysis is performed with the assumption that current developmental programs will achieve a process for cost-effectively separating pure hydrogen from natural gas/hydrogen mixtures to produce a separable and versatile chemical and fuel commodity. The energy systems formulation used to evaluate the role of hydrogen in the energy infrastructure is the Reference Energy System (RES). The RES is a network diagram that provides an analytic framework for incorporating all resources, technologies, and uses of energy in a uniform manner. A major aspect of the study is to perform a market analysis of traditional uses of resources in the various consuming sectors and the potential for hydrogen substitution in these sectors. The market analysis will focus on areas of industry where hydrogen is used as a feedstock rather than for its fuel-use opportunities to replace oil and natural gas. The sectors of industry where hydrogen is currently used and where its use can be expanded or substituted for other resources include petroleum refining, chemicals, iron and steel, and other minor uses.

0300 NATURAL GAS

0350 Storage

REFER ALSO TO CITATION(S) 31811

04 OIL SHALES AND TAR SANDS

0401 Reserves And Exploration

31772 (PB—82-134883) Oil-yield resources for oil-shale sequences in core from the Piceance Creek Basin, Colorado, that average 10, 15, 20, 25, 30, 35, and 40 gallons per ton. Data file. Pitman, J.K. (Geological Survey, Denver, CO (USA). Geologic Div.). 1981. mag tape, vp. Geological Survey, Denver, CO.

The Oil-Shale Data Analysis Program developed by the U.S. Geological Survey (Pitman and others, 1972) was designed primarily for the computation of resource estimates from Fischer assay and saline mineral data. Recently, the program was revised by the addition of an algorithm that will compute more systematic and accurate resource values than were previously reported (Watts and VanTrump, 1976). The data on the tape were generated from the algorithm, and consist of tables of oil-shale sequences that maintain specified average oil yields for oil-shale cores in the Piceance Creek Basin, Colorado. Each file corresponds to one well core, and contains a 60 line/page formatted printout of these tables. The tables consist of thickness, value, and resource for oil-shale sequences that maintain an average oil yield of 10, 15, 20, 25, 30, 35, and 40 gallons per ton. Excluded from averages are sequences of lean oil shale greater than 10 feet thick whose minimum oil yield is generally 15 gallons per ton or less. The Fischer assay data used to generate these tables are on magnetic tape available through NTIS report PB-230 607/AS and (Pitman, 1981). In addition to resource evaluation, these data should be useful for delineating minable zones of oil shale that maintain a certain thickness, grade, and resource.

0400 OIL SHALES AND TAR SANDS

0404 Oil Production, Recovery, And Refining

REFER ALSO TO CITATION(S) 31775, 31776

31773 (CONF-820217—5) Conversion of kerogen of Eastern US oil shale by tetralin and hydrogen. Mason, D.M. (Institute of Gas Technology, Chicago, IL (USA)). 1982. 12p. Inst. of Gas Technology, 3424 S. State Street, IIT Center, Chicago, IL 60616.

From 9. energy technology conference; Washington, DC, USA (16 Feb 1982).

Portions of document are illegible.

Chemical analyses and tests, petrographic data, hydroretorting tests by thermobalance, and extractions of kerogen by Tetralin have been obtained on a suite of eight Eastern oil shales and, except for petrography, on a Colorado oil shale. The organic carbon-hydrogen ratios of the Eastern oil shales range from 10.5 to 13.6 on the Eastern oil shales, compared to 8.36 on the Colorado shale. The

petrographic data indicated that the differences among the Eastern oil shales arise mostly from differences in their content of vitrinite (woody debris). Organic carbon conversion, both to liquid and total, in hydroretorting correlates to some extent with extraction of kerogen by Tetralin. Conversion decreases with increase in organic carbon-hydrogen ratio. The scatter of results, however, indicates that additional or different parameters are required for satisfactory correlation of hydroretorting yield. When one shale is excepted, organic carbon conversion by Tetralin correlates well with organic carbon-hydrogen ratio.

0405 Properties And Composition

REFER ALSO TO CITATION(S) 31772, 31828

31774 **(PB—82-134875) Oil-shale Fischer assay analysis from selected coreholes in the Piceance Creek Basin, Colorado. Data file.** Pitman, J.K. (Geological Survey, Denver, CO (USA). Geologic Div.). 1981. vp, mag tapep. Source tape is in EBCDIC character set. Tapes can be prepared in most standard 7 or 9 track recording modes for one-half inch tape. Identify recording mode desired by specifying character set, track, density, and parity. Call NTIS Computer Products if you have questions.

A magnetic tape consisting of oil-shale Fischer assay data for selected well cores in the Piceance Creek Basin was prepared as a supplement to NTIS tape PB-230 607/AS. Both tapes serve as a data base for calculating oil-shale resources (Pitman, 1981). The tape is in standard IBM format and has the following specifications: EBCDIC (IBM standard), card-image, blocksize 1720 (blocked 20 to 1), record length 86, odd parity, 1,600 bpi, 9-track, no label tape. Each data file on the tape consists of records containing oil-shale analyses for one well core. The first record in a data file consists of a well-core identifier which is a three-digit number preceded by the character 'C'. The second record contains the well name and location, and the remaining records contain Fischer assay data.

31775 **Stability of diesel fuels made from shale oil.** Irish, G.E.; Richardson, R.L. (Union Oil Co. of California, Brea). *American Society for Testing and Materials, Special Technical Publication;* No. 751, 76-83(1981). (ASTM-STP—751; CONF-8006225—).

From American Society for Testing and Materials symposium on petroleum products and lubricants; Chicago, IL, USA (24 Jun 1980).

A study was carried out to determine the type and degree of processing which will be needed to produce a diesel fuel from shale oil which is sufficiently stable to be used as an alternative to petroleum-derived diesel fuels. Several test methods were used to evaluate the stabilities of shale oil products which had been refined in various ways. There is an apparent need for an accelerated stability test method which will correlate with long-term storage of diesel made from shale oil.

0407 Health And Safety

REFER ALSO TO CITATION(S) 32587

0409 Waste Research And Management

31776 **(PNL-SA—9805) Evaporation of in-situ oil-shale-retort water.** Mercer, B.W.; Wakamiya, W.; Mason, M.J. (Pacific Northwest Lab., Richland, WA (USA)). 23 Jul 1981. Contract AC06-76RL01830. 10p. (CONF-8106109—4). NTIS, PC A02/MF A01. Order Number DE82005930.

From Workshop on processing needs and methodology for wastewaters from the conversion of coal, oil shale and biomass to synfuels; Germantown, MD, USA (Jun 1981).

Evaporation appears to be competitive with respect to treatment costs when compared with conventional biological and physical chemical treatment. Furthermore, the condensate produced by evaporation is much superior in quality than the effluent produced by conventional biological and physical chemical treatment. Based on bench-scale tests, operational problems are expected to be minimal with full-scale evaporation of Geokinetics in-situ retort water.

0400 OIL SHALES AND TAR SANDS

0410 Enviromental Aspects

REFER ALSO TO CITATION(S) 31730

05 NUCLEAR FUELS

0502 Exploration

31777 **(GJBX—1-82) NURE aerial gamma ray and magnetic detail survey of portions of northeast Washington. Final report.** (Carson Helicopters, Inc., Perkasie, PA (USA)). Nov 1981. Contract AC13-76GJ01664. 299p. NTIS, PC A13/MF A01. Order Number DE82007141.

The Northeast Washington Survey was performed under the United States Department of Energy's National Uranium Resource Evaluation (NURE) Program, which is designed to provide radioelement distribution information to assist in assessing the uraniferous material potential of the United States. The radiometric and ancilliary data were digitally recorded and processed. The results are presented in the form of stacked profiles, contour maps, flight path maps, statistical tables and frequency distribution histograms. These graphical outputs are presented at a scale of 1:62,500 and are contained in the individual Volume 2 reports.

0500 NUCLEAR FUELS

0502 Exploration

31778 **(GJBX—182-Vol.2B(Midnite)) NURE aerial gamma-ray and magnetic detail survey: Midnite-Sherwood Mines, Washington area. Final report.** (Bendix Field Engineering Corp., Grand Junction, CO (USA); Carson Helicopters, Inc., Perkasie, PA (USA)). Jun 1981. Contract AC13-76GJ01664. 1206p. NTIS, PC E99/MF $7.40. Order Number DE82010011.

Includes 11 sheets of 48x reduction microfiche.

Volume II contains the radiometric multiple parameter stacked profiles, magnetic and ancillary stacked profile data, multivariate histograms, and statistical summaries for uranium, thorium, potassium, uranium/potassium, uranium/thorium, and uranium/potassium. (ATT)

31779 **(INIS-mf—6752) Field trial of CSIRO intrinsic germanium and natural gamma sirolog probes at AMDEL uranium calibration test pits.** Clark, G.C.; Dickson, B.L.; Borsaru, M.; Ceravolo, C.; Huppert, P. Dec 1980. 28p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82780248.

A field trial of the CSIRO intrinsic germanium probe was made at the Amdel (Australian Mineral Development Laboratories) uranium calibration pits in South Australia. The aim was to demonstrate the capability of the probe to analyze directly uranium in-situ by the detection of the 1.001 MeV γ-ray from Pa-234m. The trial has shown that the commercially available electronics used require further improvement, particularly in their ability to handle the high count rates encountered in this application, and that the detector must be shielded to attenuate low-energy radiation. The ratio of the count rates measured in pits 1 and 3 is in good agreement with the ratio of the assigned grades of the two test pits. The test pits were also logged using a scintillation NaI(T1) probe. The results obtained demonstrate the effect of Compton scattering on tripping factors used in spectral logging for potassium, uranium and thorium analyses.

31780 **(INIS-mf—6777) Determination of the uranium concentration in soil solutions by the fission track registration technique.** Fernandes, G.P. (Instituto Militar de Engenharia, Rio de Janeiro (Brazil)). Feb 1980. 111p. (In Portuguese). NTIS (US Sales Only), PC A06/MF A01. Order Number DE82700238.

The fission tracks registration technique was used to determine the uranium concentration in soil solutions. The Makrofol KG, a synthetic plastic manufactured by Bayer, was used as a detector and the wet method was applied. From the calibration curves obtained, it was possible to determine uranium concentrations in soil solutions, from 90 to 320 μg U/l, with an error between 9.4% and 4.0%, respectively. The method was applied to a few soil samples from Pocos de Caldas, Minas Gerais in Brazil. The uranium concentrations in the sample and residues were also determined by other methods to compare the results obtained; only one sample showed deviation from the results obtained by the fission tracks method. And this discrepancy was explained in a reasonable way. It was shown that the fission tracks technique can be used with sucess for application in soil solutions.

31781 **(SAND—80-0064) PFN tool test and calibration system.** Stephenson, W.A. (Sandia National Labs., Albuquerque, NM (USA)). Dec 1981. Contract AC04-76DP00789. 48p. NTIS, PC A03/MF A01. Order Number DE82007553.

A system has been developed for the functional testing and neutron output calibration of the PFN (Prompt Fission Neutron) Uranium Logging Tool. The system was designed primarily for field work and consists of a special vehicle as well as test apparatus. Only the pertinent instrumentation is described. This document will serve as an Instruction and Test Equipment service manual for those involved with calibration of the neutron output of the PFN tool.

31782 **(GJBX—182-Vol.2B(Mt.Leona)) NURE aerial gamma-ray and magnetic detail survey: Mt. Leona-Nancy Creek, Washington area. Final report.** (Bendix Field Engineering Corp., Grand Junction, CO (USA); Carson Helicopters, Inc., Perkasie, PA (USA)). Jul 1981. Contract AC13-76GJ01664. 1178p. NTIS, PC A99/MF A01. Order Number DE82007143.

Volume II contains the radiometric multiple parameter stacked profiles for the Mt. Leona-Nancy Creek, Washington area.

0503 Mining

REFER ALSO TO CITATION(S) 32596

31783 **(CRWR—180) Streamline-concentration balance model for in-situ uranium leaching and site restoration.** Bommer, P.M.; Schechter, R.S.; Humenick, M.J. (Texas Univ., Austin (USA). Center for Research in Water Resources). Mar 1981. 260p. Center for Research in Water Resources, 10100 Burnet Road, Austin, TX 78758, $8.75.

Portions of document are illegible.

This work presents two computer models. One describes in-situ uranium leaching and the other describes post leaching site restoration. Both models use a streamline generator to set up the flow field over the reservoir. The leaching model then uses the flow data in a concentration balance along each streamline coupled with the appropriate reaction kinetics to calculate uranium production. The restoration model uses the same procedure except that binary cation exchange is used as the restoring mechanism along each streamline and leaching cation clean up is simulated. The mathematical basis for each model is shown in detail along with the computational schemes used. Finally, the two models have been used with several data sets to point out their capabilities and to illustrate important leaching and restoration parameters and schemes.

31784 **(NP—2902698) Application of bacterial leaching technology to deep solution-mining conditions for uranium extraction. Final report, September 1, 1978-September 30, 1981.** Brierley, J.A.; Brierley, C.L.; Torma, A.E. (New Mexico Inst. of Mining and Technology, Socorro (USA); New Mexico Bureau of Mines and Mineral Resources, Socorro (USA)). Mar 1982. 36p. (EMD—2-68-3319). New Mexico Energy Research and Development Inst., P.O. Box 5307, Santa Fe, NM 87502.

Microorganisms were evaluated for use in recovery of uranium under conditions of in-situ solution mining. The cultures tested were Thiobacillus ferrooxidans, the faculative-thermophilic TH3 strain, and two Sulfolobus species. Growth of the organisms occurred in the presence of 0.34 to 5.0 mM uranyl ion with higher concentrations being inhibitory. Uranium ore from the Anaconda Minerals Co. Jackpile mine was not readily leachable by microorganisms. To support bacterial activity the ore was supplemented with pyrite or ferrous iron. The ore possessed some toxic properties. T. ferrooxidans was able to assist in leaching of uranium from the ore at a hydrostatic pressure of 10.3 MPa.

31785 **(PER—61) Computerised information system for the processing of borehole data with regard to uranium sources in the Republic of South Africa.** Grant, M.A.; Maritz, F.I. (Atomic Energy Board, Pelindaba, Pretoria (South Africa)). Jan 1981. 90p. (In Afrikaans). NTIS (US Sales Only), PC A05/MF A01. Order Number DE82700485.

The various mining companies in the Republic of South Africa are under legal obligation to supply data concerning uranium resources to the Atomic Energy Board. As the process of manually summarising data and retrieving information for a great number of boreholes is a time-consuming and tedious task, a computerised system was needed to supply this information in a meaningful manner. Following a thorough systems analysis, a database information system was designed. Application programs were developed for the input, processing and tabulation of the data. This report describes the data-base organisation, consisting of a network of master and transaction files. A master file contains one or more keys which are used to input data into or extract data from a transaction file. Master and transaction files are normally linked by means of a linkpath, but in this application it was necessary to define some master files as unlinked units. The input into the database consists of administrative, stratigraphic and lithological data as well as data of gold, uranium, silver, thorium, platinum, sulphur and molybdenum mineralisation. Five types of data cards were developed to record the abovementioned information. Examples of the various data cards are contained in the report. On retrieving data the user of this system has several options regarding the sequence in which information is retrieved and the contents of the tables. The procedure to be used and the various options ar summarised in detail. The appendices summarise the utility programs, supporting job-control language and code lists. The program was written in PL/1 and the database is the TOTAL DATA BASE MANAGEMENT SYSTEM - RELEASE 8,0 from CINCOM SYSTEMS, INC.

0505 Enrichment

31786 **(KAERI/RR—256/80) Apparatus for the isotope separation.** Suh, D.W.; Kim, T.S.; Lee, I.W.; Whang, C.K.; Oh, Y.K.; Sung, N.J. (Korea Advanced Energy Research Inst., Seoul (Republic of Korea)). 1981. 30p. (In Korean). NTIS (US Sales Only), PC A03/MF A01. Order Number DE82700130.

To achieve a separation of isotopes by multiphoton dissociation method, high power laser is needed. In our laboratory, a UV photoionizated TEA CO_2 laser which have a power of 1 Mega watt was successfully constructed. In TEA CO_2 laser operation it is important for high power and high efficiency to establish a stable glow discharge uniformly, UV preionization employing a trigger wire was used. The uniformity of discharge between electrodes depended on the capacity of storage capacitor. And the number of initial electrons effective in the main gap discharge depended on the position of a wire. The electrode shape which have a Rogowski

profile was an important parameter for the uniform discharge. Optimum performance was obtained with 1:1:8 ratio of CO_2:N_2:He at atmospheric pressure. Also a discharge tube (68 cm in length) for CW ion laser was made of quartz tubes. It consists of a small bored tube (5 mm i.d.), water jacket, gas return path, Brewster windows, and electrodes closed by a molybdenum foil seal. The current-voltage characteristics have been investigated up to current density of 66A/cm^3 for the tube filled with 0.1 torr Xe.

31787 **(RI—136) Electromagnetic mass separator for heavy element radioisotope separation.** Abdulakhatov, M.K.; Akopov, G.A.; Belykh, V.S.; Gogoleva, T.D.; Evdokimov, A.G.; Lyubtsev, R.I.; Mishin, V.Ya.; Orlov, V.I.; Rubtsov, E.M. (Radievyj Inst., Leningrad (USSR)). 1980. 15p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700449.

An electromagnetic mass separator of a sector type intended for uranium isotope separation and U-234 production is described. The working chamber, magnet and vacuum system are located in a special "canyon". Operation controlling of the vacuum system, power supply system, as well as controlling of the installation operation regime is carried out remotely from the controlling panel. To simplify periodic decontamination of the working chamber a dismountable protective cover (liner) made of thin stainless steel is mounted inside it. The main parameters of the electromagnetic separator are the following: 2 rad - angle of the analyzing magnet sector, 60 A/m - maximum field intensity in the gap centre, 46 keV - maximum energy of single-charge ions, +-5 deg - maximum angle of horizontal beam divergence, 1500 - resolution of the mass peaks at the half-height, 250 - relative isotopic enrichment. The problems of installation adjustment, the methods of uranium preparation treatment and the problems of radiation safety are discussed. The results of uranium-234 accumulation are presented. Uranium tetrachloride is used as an initial preparation for U-234 accumulation. As a result of reprocessing of 24 g uranium tetrachloride 4.73 mg U-234 is extracted. The U-234 samples with 95.3 % purity are prepared.

0507 Fuels Production And Properties

REFER ALSO TO CITATION(S) 32199

0508 Spent Fuels Reprocessing

REFER ALSO TO CITATION(S) 31807, 32194

31788 **(ORAU—190) Color coding of televised task elements in remote work: a literature review with practical recommendations for a fuel reprocessing facility.** Clarke, M.M.; Preston-Anderson, A. (Oak Ridge Associated Universities, Inc., TN (USA)). Nov 1981. Contract AC05-76OR00033. 18p. NTIS, PC A02/MF A01. Order Number DE82005807.

The experimental literature on the effects of color visual displays was reviewed with particular reference to the performance of remote work in a Hot Experimental Facility (HEF) using real scene closed-circuit television systems. It was also reviewed with more general reference to the broader range of work-related issues of operator learning and preference, and display specifications. Color has been shown to enhance the performance of tasks requiring search and location and may also enhance tracking/transportation tasks. However, both HEF large-volume searching and tracking can be computer augmented, alleviating some of the necessity for a color code to assist an operator. Although color enhances long-term memory and is preferred to black and white displays, it has not been shown to have a specific advantage in the performance of unique tasks (where computer augmentation is more problematic and visual input to operator is critical). Practical display specifications are discussed with reference to hue and size of color code, target size, ambient illumination, multiple displays, and coatings. The authors conclude that the disadvantages to color television in the HEF far outweigh any possible advantages and recommend the use of high-resolution black and white systems, unless future experiments unequivocally indicate that (1) color is superior to black and white for in-situ task performance or (2) it is imperative in terms of long-range psychological well-being.

31789 **(ORNL/TM—8030) Consolidated fuel reprocessing program. Progress report, July 1-September 30, 1981.** (Oak Ridge National Lab., TN (USA)). Dec 1981. Contract W-7405-ENG-26. 42p. NTIS, PC A03/MF A01. Order Number DE82006956.

Technical progress is reported in overview fashion in the following areas: process development, laboratory R and D, engineering research, engineering systems, integrated equipment test facility (IET) operations, and HTGR fuel reprocessing. (DLC)

31790 **Methods of availability planning for process structures with interim storage.** Fischer, F.; Haussmann, W. pp 139-144 of Technische Zuverlaessigkeit. Ihre Verwirklichung unter den Bedingungen der Zukunft. Duesseldorf, Germany, F.R.; VDI-Verlag (1981). (In German)

From 11. meeting - how to achieve technical reliability under conditions relating to the future; Nuernberg, Germany, F.R. (13 - 15 May 1981).

Production systems consisting of a number of connected process elements (process units, machinery) have been investigated. To begin with a system without interim storage is presented along with an exact Buzacott method for the calculation of system availability of a two-machine-one-store-system. The results are applied to an approximation method for multiple-store line systems. As an example, the overall availability of a reprocessing plant with interim storage facilities is described as a function of partial availabilites and storage capacities, expressed as a multiple of the product of repair times and throughput.

0509 Transport And Storage

31791 **(KFK—3084) Interim storage requirements for spent LWR fuel elements for alternative scenarios of an increased use of nuclear energy in the Federal Republic of Germany.** Fischer, P.M. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Abt. fuer Angewandte Systemanalyse). Dec 1980. 95p. (In German). NTIS (US Sales Only), PC A05/MF A01. Order Number DE82780091.

The calculations of interim storage requirements for spent fuel elements from light water reactors are based on a possible development of the installed nuclear capacity in the Federal Republic of Germany of roughly 50 GWe (or 35 GWe) in the year 2000, and of about 90 GWe (or 45 GWe) from the year 2030 (2020) onward. The calculations are performed for the case that only LWRs will be installed, as well as for the case that from the year 2015 on the Fast Breeder Reactor will be introduced on a commercial scale. The impact of different strategies of waste management and reprocessing, such as start-up of the reprocessing of LWR fuel elements in 2000, conditioning and ultimate storage of a part of the spent fuel elements, on the interim storage requirements over time is analysed.

31792 **(PNL-SA—10022) Package receipt assay systems.** Brodzinski, R.L. (Pacific Northwest Lab., Richland, WA (USA)). Nov 1981. Contract AC06-76RL01830. 7p. (CONF-811130—15). NTIS, PC A02/MF A01. Order Number DE82005781.

From 3. annual DOE participants information meeting on low-level waste management; New Orleans, LA, USA (4 Nov 1981).

Relevant waste package parameters are identified. Waste package measurement requirements and capabilities are evaluated and prioritized. A passive TRU package assayer is described.

0510 Marketing And Economics

REFER ALSO TO CITATION(S) 31745

0520 Waste Management

REFER ALSO TO CITATION(S) 31791, 31792, 31956, 32184, 32523, 32534, 32535, 32602

31793 (DOE/TIC—3387) Low-level radioactive wastes. A bibliography of additions to the Energy Data Base in 1981. Grissom, M.C. (ed.). (Department of Energy, Oak Ridge, TN (USA). Technical Information Center). Dec 1981. 65p. NTIS, PC A04/MF A01. Order Number DE82004645.

Access to information on management of low-level radioactive wastes is provided by this special bibliography and other products of the Technical Information Center. Citations to 215 references on low-level radioactive wastes added to the Energy Data Base in 1981 are presented. The abstracts are grouped in broad subject categories. Within each category the arrangement is by report number for reports, followed by non-reports in reverse chronological order. These citations are to research reports, journal articles, books, patents, theses, and conference papers. Five indexes, each preceded by a brief description, are provided: Corporate Author, Personal Author, Subject, Contract Number, and Report Number.

31794 (DOE/TIC—2005250) Solid Waste Information Management System (SWIMS). Data summary, Fiscal Year 1980. Batchelder, H.M. (EG and G Idaho, Inc., Idaho Falls (USA)). May 1981. Contract AC07-76ID01570. 180p. (IDO—10086(80)). NTIS, PC A09/MF A01. Order Number DE82005250.

The Solid Waste Information Management System (SWIMS) maintains computerized records on a master data base. It provides a comprehensive system for cataloging and assembling data into output reports. The SWIMS data base contains information on the transuranic (TRU) and Low-Level Waste (LLW) generated, buried, or stored by DOE facilities. The generation data covers the period from the FY 1976 transition quarter through FY 1980. The burial and storage data includes the period from site initiation through FY 1980. This document includes the waste data reports summarized at the DOE level from the SWIMS, presenting the FY 1980 data and the FY 1981 forecasts. Detailed data summarized at the DOE operations office level are also included in the Appendices. Each report is detailed by nuclide category. The categorization allows the user to separate TRU data from LLW data, etc. The eight nuclide categories are described.

31795 (LA—8959-PR) Research and development related to the Nevada Nuclear Waste Storage Investigations. Progress report, April 1-June 30, 1981. Erdal, B.R.; Daniels, W.R.; Vaniman, D.T.; Wolfsberg, K. (comps.). (Los Alamos National Lab., NM (USA)). Oct 1981. Contract W-7405-ENG-36. 71p. NTIS, PC A04/MF A01. Order Number DE82010987.

This report summarizes the contribution of the Los Alamos National Laboratory to the Nevada Nuclear Waste Storage Investigations for the third quarter of FY-1981. Progress reports on the following tasks are presented: waste package development; nuclide migration experiments in G tunnel-laboratory studies; geochemistry of tuff; mineralogy-petrology of tuff; volcanic hazard investigations; site evaluation; rock physics studies; exploratory shaft design; and quality assurance. (ATT)

31796 (MLM-MU—81-72-0003-Vol.1) Mound cyclone incinerator. Volume I. Description and performance. Klingler, L.M. (Mound Facility, Miamisburg, OH (USA)). 22 Dec 1981. Contract AC04-76DP00053. 52p. NTIS, PC A04/MF A01. Order Number DE82006141.

The Mound cyclone incinerator was developed to fill a need for a simple, relaible incinerator for volume reduction of dry solid waste contaminated with plutonium-238. Although the basic design of the incinerator is for batch burning of solid combustible waste, the incinerator has also been adapted to volume reduction of other waste forms. Specialized waste feeding equipment enables continuous burning of both solid and liquid waste, including full scintillation vials. Modifications to the incinerator offgas system enable burning of waste contaminated with isotopes other than plutonium-238. This document presents the design and performance characteristics of the Mound Cyclone Incinerator for incineration of both solid and liquid waste. Suggestions are included for adaptation of the incinerator to specialized waste materials.

31797 (NLCO—008EV) Environmental surveillance plan for the Department of Energy's Niagara Falls Storage Site (NFSS), Lewiston, New York. Englert, J.P.; Hinnefeld, S.L. (National Lead Co. of Ohio, Cincinnati (USA)). 9 Sep 1981. Contract AC05-76OR01156. 55p. NTIS, PC A04/MF A01. Order Number DE82005853.

The Niagara Falls Storage Site (NFSS) is a United States Department of Energy owned facility used for the storage of low-level radioactive residues. The site occupies 190 acres of the former Lake Ontario Ordnance Works and is located in the Niagara County town of Lewiston, in western New York State. The city of Niagara Falls is approximately eight (8) miles south of the NFSS. The purpose of this report is to describe environmental monitoring programs presently operated by NLO, and to suggest programs and revisions which should be implemented as a result of NLO's remedial actions at the NFSS.

31798 (NP—2902483) Storage of low-level radioactive waste: a potential West Virginia alternative. Circular No. C-21. Lessing, P. (West Virginia Geological and Economic Survey, Morgantown (USA)). 1981. 23p. Director, State Geologist, Mont Chateau, Mont Chateau Rd., P.O. Box 879, Morgantown, WV 26505 $3.00.

Storage in abandoned limestone mines is highly recommended for low-level radioactive wastes (LLW) as an alternative to shallow-land burial. This does not include natural limestone caves. Limestone mines that qualify should be those above the water table. The advantages of this alternative are: (1) limestone mines are already excavated, and their dimensions are very large; (2) all interior surfaces of the mine could be grouted and sealed to eliminate surface and ground water seepage into the mine; (3) limestone, under most circumstances, is an extremely strong rock; (4) separate storage rooms could be constructed with dated label indicating when the LLW in each room could be removed; (5) the interior dimensions of limestone mines provides another advantage for management of a LLW storage facility; (6) drums of LLW stacked in rows in separate, labelled rooms permit 24-hour monitoring and inspection; (7) retrieval could be easily accomplished. One of the requirements for the use of this proposed storage is that the LLW should be segregated into drums based on the half-life of isotopes. This is done at the source of the LLW. Thus drums containing short half-lives could remain at the generating source to decay. Other drums could be stored in the limestone mine for predetermined periods of time. (ATT)

31799 (ORNL/MIT—337) Study of droplet formation for preparation of spheres by internal gelation. Chu, C.R.; Card, J.C. (Oak Ridge National Lab., TN (USA); Massachusetts Inst. of Tech., Oak Ridge, TN (USA). School of Chemical Engineering Practice). Jan 1982. Contract W-7405-ENG-36. 53p. NTIS, PC A04/MF A01. Order Number DE82007500.

The internal-gelation process can be used to permanently immobilize highly radioactive nuclear wastes. A study was conducted to determine the factors affecting the formation of stable, uniform droplets from a vibrating nozzle, which is a critical step in this process. Experimental data were collected using four nozzle diameters (325 to 586 μm) with jet velocities ranging from 1 to 10 m/s, and three test liquids, whose physical properties cover the possible range of the waste fluid. A dimensional analysis identified the pertinent dimensionless groups as Reynolds, Weber, Froude, and Power numbers, and a dimensionless droplet spacing. Power-function correlations of the data in these dimensionless groups are presented, which define the region of good droplet formation. A unique catcher-stream design is also presented, which improves performance of the process at higher flow rates and frequencies.

31800 (PNL-SA—8408) High-level waste immobilization program. Quarterly report, October-December 1979. Larson, D.E.; Rusin, J.M.; Ross, W.A. (Pacific Northwest Lab., Richland, WA (USA)). 1979. Contract AC06-76RL01830. 16p. NTIS, PC A02/MF A01. Order Number DE82007636.

In hydrothermal environment tests, three simulated high-level waste (HLW) glasses, supercalcine, and SYNROC exhibit similar leaching behavior. Releases from the glasses are lowest at temperatures below 250°C (the expected repository temperature

range). Corrosion tests of candidate metallic-container materials in 250°C Hanford ground water are under way and a group of polymers that shows good resistance to 200°C water in autoclave tests is undergoing gamma irradiation. Methods of reducing melt-foaming in ceramic melters were investigated. Inclusion of monoxides of iron, nickel and manganese in the calcine significantly improved melt quality and reduced foaming. The addition of cornstarch to the melt, which inhibits foaming in laboratory studies, continues to be evaluated. A successful pilot-scale test of the Spray Calciner/In-Can Melter process was done using simulated waste representing the combined contents of the neutralized and Thorex waste tanks at the Western New York Nuclear Service Center. Flexibility of the process for handling high-sodium waste was demonstrated.

31801 **(PNL-SA—8604) Environmental effects of reactor waste disposal alternatives.** Unruh, C.M. (Pacific Northwest Lab., Richland, WA (USA)). May 1980. Contract AC06-76RL01830. 37p. (CONF-8006214—1). NTIS, PC A03/MF A01. Order Number DE82005911.

From Summer Faculty Institute Center for Educational Affairs conference; Argonne, IL, USA (16 Jun 1980).

This present document, Environmental Impact Statement on Management of Commercially Generated Radioactive Waste, describes ten alternative methods for disposal of nuclear wastes and evaluates their anticipated environmental impacts. The ten alternatives are: (1) geologic disposal using conventional mining techniques; (2) chemical resynthesis; (3) very deep hole concept; (4) rock melting concept; (5) island disposal; (6) sub-seabed geologic disposal; (7) ice sheet disposal; (8) reverse-well disposal; (9) partitioning and transmutation; and (10) space disposal. In evaluating the various technical strategies, issues and environmental impacts have been analyzed as best understood currently. Based on the analysis presented here, and in the light of the greater depth of knowledge on geologic disposal, DOE proposes that: (1) the disposal of radioactive wastes in geologic formations can likely be developed and applied with minimal environmental consequences; and (2) therefore the program emphasis should be on the establishment of mined repositories as the operative disposal technology.

31802 **(PNL-SA—8927) Assessment of effectiveness of geologic isolation systems. Radionuclide-transport sensitivity studies.** Cole, C.R. (Pacific Northwest Lab., Richland, WA (USA)). Sep 1980. Contract AC06-76RL01830. 12p. (CONF-801209—10). NTIS, PC A02/MF A01. Order Number DE82005872.

From 2. annual National Waste Terminal Storage (NWTS) information meeting; Columbus, OH, USA (9 Dec 1980).

This paper will summarize some of the sensitivity study results for the Paradox and the INFCE studies. Sensitivity studies are performed by determining the effect that a change in a single parameter has on system response. Many of the sensitivity studies performed for the Paradox were predictable with results varying in a linear manner with the parameter being changed. For the Paradox study (a two-aquifer system connected via a fracture through the bedded salt), sensitivity studies were performed to determine what effect fracture resistance has on predicted flow through the repository and the resultant water velocity in the transporting aquifer. Results indicated that interaquifer transfer could nearly double from the base case but was ultimately limited by the upper and lower aquifer characteristics. The important result, however, was that water velocity in the contaminant transporting aquifer was affected very little. While the increased flow through the repository could potentially dissolve the waste over a shorter time frame, one of the main isolation parameter (travel time) was affected very little. The above sensitivity results for variations in typical hydrologic parameters, while interesting, are a priori predictable. The more important sensitivity study results relate to travel time, variation in travel time, and the combined effects of travel time variation and contaminant retardation factors as well as the insight these studies have provided in helping us better understand the complex transport process for radionuclides and radionuclide chains.

31803 **(PNL-SA—9440) Review of multibarrier waste from development.** Rusin, J.M. (Pacific Northwest Lab., Richland, WA (USA)). Apr 1981. Contract AC06-76RL01830. 6p. (CONF-810650—3). NTIS, PC A02/MF A01. Order Number DE82005982.

From International seminar on chemistry and process engineering for high-level waste solidification; Julich, F.R. Germany (1 Jun 1981).

The application of coatings and matrices as part of a multibarrier concept for the immobilization of nuclear wastes has been demonstrated by several investigators. The multibarrier concept provides an enhanced waste form by improvements in mechanical strength, leach resistance, and thermal stability. Process complexity is increased in the multibarrier process due to additional processing steps, high-coating temperatures, molten metal transfer, and flammable coating gas mixtures.

31804 **(PNL-SA—9739) Liquid-waste immobilization by agglomeration.** Timmerman, C.L.; Carter, J.G. (Pacific Northwest Lab., Richland, WA (USA)). Aug 1981. Contract AC06-76RL01830. 15p. (CONF-810897—2). NTIS, PC A02/MF A01. Order Number DE82005917.

From 17. biennial conference of the Institute of Briquetting and Agglomeration; Reno, NV, USA (31 Aug 1981).

Liquid nuclear and chemical wastes may require their immobilization into a stable waste form via a processing scheme. An agglomeration process to immobilize these wastes with a solid, absorbent binder is presented. An experiment using a simulated (nonradioactive) liquid nuclear-waste stream and sodium titanate as the solid binder was performed to test the feasibility of this process. Results from this experiment are encouraging and indicate a need to test this liquid waste agglomeration process on other liquid waste streams.

31805 **(PNL-SA—10019) Effect of organic complexants on the mobility of low level waste radionuclides in soils.** Swanson, J.L. (Pacific Northwest Lab., Richland, WA (USA)). Oct 1981. Contract AC06-76RL01830. 12p. (CONF-811130—16). NTIS, PC A02/MF A01. Order Number DE82005839.

From 3. annual DOE participants information meeting on low-level waste management; New Orleans, LA, USA (4 Nov 1981).

The effect of organic complexants, EDTA and DTPA, on the equilibrium sorption properties of europium, cesium strontium, cobalt and nickel on Hanford soils were investigated. All work was performed in the presence of air. Humic acid which is also a complexant occurs in some soils. The goal of the work was to obtain data that are at equilibrium so that the results would be meaningful in a thermodynamic sense. This goal was met with europium, cesium and strontium, but was not possible with cobalt and nickel where slow kinetics prevented equilibrium data from being obtained. (ATT)

31806 **(RHO-BWI-C—86) Numerical prediction of basalt response for near-surface test facility heater tests No. 1 and No. 2.** Hocking, G.; Williams, J.R.; Boonlualohr, P.; Mathews, I.; Mustoe, G. (Rockwell International Corp., Richland, WA (USA). Rockwell Hanford Operations). Nov 1980. Contract AC06-77RL01030. 105p. NTIS, PC A06/MF A01. Order Number DE82007011.

This report details the numerical predictions undertaken by Dames and Moore for Rockwell Hanford Operations' Basalt Waste Isolation Project. Predictions are made for the temperatures, stresses, strains and displacements in the basalt around Full-Scale Heater Tests No. 1 and No. 2 at the Near-Surface Test Facility using the finite element code DAMSWEL. The rock around the main heaters was modeled using an axisymmetric idealization in which deformational properties were transversely isotropic with a bilinear stress/strain relationship which was independent of temperature. The selection of the input parameters represents an engineering assessment of their values based on the results of laboratory tests and in situ measurements. The predictive modeling analysis, using the best information available as of April 1980, was completed prior to test startup. Additional information on geology, geological characterization, rock-mass characterization, laboratory properties, and field properties of basalt is being acquired on a regular basis as part of the overall Near-Surface Test Facility test program. An assessment of the effect of additions to the data base upon the predictive modeling and test analysis shall be made on a periodic basis.

31807 **(RHO-LD—165) Results of the separations area ground-water monitoring network for 1980.** Graham, M.J.; Brown, W.R. (Rockwell International Corp., Richland, WA (USA). Rockwell Hanford Operations). Nov 1981. Contract AC06-77RL01030. 77p. NTIS, PC A05/MF A01. Order Number DE82006951.

The monitoring program for assessing ground-water quality under low-level radioactive disposal facilities is based upon an understanding of the hydrology of this area. Knowledge of the ground-water flow system predicates well location, well completion, and sampling frequency. There were seven active cribs, and four active ponds and associated active ditches in 1980. The 216-A-3 Crib and the 216-S-11 Ditch are not monitored because they receive minor discharges. In 1980, concentrations of radionuclides (except tritium) in samples from the wells monitoring these active sites were below 10% of Table II guidelines. Tritium, in samples from wells monitoring 216-A-37 Crib, reached 33% of Table II guidelines and samples from a well monitoring 216-S-25 Crib exceeded Table II guidelines. The 216-A-37 Crib received discharges of 242-A Evaporator steam condensate containing tritium in concentrations as high as 4390 pCi/mL in 1980 (1.6 times Table II guidelines). Discharge of process condensate from the 242-S Evaporator to 216-S-25 Crib containied tritium concentrations as high as 3930 pCi/mL. Tritium is incorporated into water molecules and is not adsorbed onto the sediments. Therefore, the tritium discharged to a crib will move under unsaturated flow to the ground water. The other long-lived radionuclides prevalent in the waste stream are strongly adsorbed (Routson et al., 1979) and thus do not reach the ground water readily.

31808 **(SAND—81-1048) In-situ tuff water migration/heater experiment: hardware mechanical design definition.** Duimstra, C.O. (Sandia National Labs., Albuquerque, NM (USA)). Nov 1981. Contract AC04-76DP00789. 116p. NTIS, PC A06/MF A01. Order Number DE82007005.

This report summarizes and documents the final, as fielded, design of the heater assembly, instrumentation placement, and packers used in the In-Situ Tuff Water Migration/Heater Experiment conducted in G-Tunnel at the Nevada Test Site in 1980. This experiment was part of the Nevada Nuclear Waste Storage Investigation Project under the specific direction of Sandia National Laboratories Geological Projects Division 4537. Detailed data analysis, experimental results, and descriptions of the instrumentation and data acquisition system will be published in separate reports.

31809 **(SAND—81-1882) Castable ceramics for hydrothermal environments: materials evaluation for the In-Situ Heat Transfer Experiment.** Bunker, B.C. (Sandia National Labs., Albuquerque, NM (USA)). Jan 1982. Contract AC04-76DP00789. 33p. NTIS, PC A03/MF A01. Order Number DE82007098.

A group of castable ceramics was evaluated for use in the heat source implantation rod in the In Situ Heat Transfer Experiment (ISHTE). Requirements for the material are long term chemical durability in high temperature seawater in addition to high compressive strength and low thermal conductivity. Test results suggest that siloxane based polymer concrete materials developed at Brookhaven National Laboratories exceed these ISHTE requirements. 7 figures, 5 tables.

31810 **(USGS-OFR—80-450) Site selection and investigation for subsurface disposal of radioactive wastes in hydraulically induced fractures.** Sun, R.J. (Geological Survey, Reston, VA (USA)). 1980. 259p. NTIS, PC A12/MF A01. Order Number DE82010967.

Injection into a thick shale formation of intermediate-level radioactive wastes (specific activity of less than 6×10^3 μCi/ml consisting mainly of radionuclides such as strontium and cesium with half-lives of less than 50 years) mixed with cement is a promising and feasible disposal method. Hydraulic fracturing provides openings in the shale to accommodate the wastes. Ion exchange and radionuclide adsorption materials can be added to the grout during mixing to further increase the radionuclide retaining capacity of the grout. After solidification of the grout, the injected wastes become an integral part of the shale formation and thus the wastes will remain at depth and in place as long as the injection zone is not subjected to erosion or dissolution. Problems concerning safety of the disposal method are: (1) potential of inducing vertical fractures; (2) phase separation during and after injections; (3) reliability of methods for determining orientation of induced fractures; (4) possibility of triggering earthquakes; and (5) radionuclides leaching and transporting by ground water. Waste injections are made in multiple-layer injection stages in an injection well. After the first series of injections are made at the greatest depth, the well is plugged by cement at the injection depth. The depth of the second series of injections is located at a suitable distance above the first injection depth. The repeated use of the injection well distributes the cost of construction of injection and monitoring wells over many injections, thereby making hydraulic fracturing and grout injection economically attractive as a method for disposal of radioactive wastes. Theoretical considerations of inducing nearly horizontal bedding-plane fractures in shale and field procedures for site selection, safety, monitoring and operation of radioactive waste disposal are discussed. Case histories are used as examples to demonstrate the theoretical applications and field operations.

31811 **Wet powder seal for gas containment.** Stang, L.G. (to Department of Energy). US Patent 4,311,409. 19 Jan 1982. Filed date 29 Aug 1979. vp.

PAT-APPL-070547.

A gas seal is formed by a compact layer of an insoluble powder and liquid filling the fine interstices of that layer. The smaller the particle size of the selected powder, such as sand or talc, the finer will be the interstices or capillary spaces in the layer and the greater will be the resulting sealing capacity, i.e., the gas pressure differential which the wet powder layer can withstand. Such wet powder seal is useful in constructing underground gas reservoirs or storage cavities for nuclear wastes as well as stopping leaks in gas mains buried under ground or situated under water. The sealing capacity of the wet powder seal can be augmented by the hydrostatic head of a liquid body established over the seal.

31812 **Submergible barge retrievable storage and permanent disposal system for radioactive waste.** Cawley, W.E.; Goldsberry, F.L. (to Dept. of Energy). US Patent 4,307,679. 29 Dec 1981. Filed date 21 Dec 1979. vp.

PAT-APPL-106203.

A submergible barge and process for submerging and storing radioactive waste material along a seabed. A submergible barge receives individual packages of radwaste within segregated cells. The cells are formed integrally within the barge, preferably surrounded by reinforced concrete. The cells are individually sealed by a concrete decking and by concrete hatch covers. Seawater may be vented into the cells for cooling, through an integral vent arrangement. The vent ducts may be attached to pumps when the barge is bouyant. The ducts are also arranged to promote passive ventilation of the cells when the barge is submerged. Packages of the radwaste are loaded into individual cells within the barge. The cells are then sealed and the barge is towed to the designated disposal-storage site. There, the individual cells are flooded and the barge will begin descent controlled by a powered submarine control device to the seabed storage site. The submerged barge will rest on the seabed permanently or until recovered by a submarine control device.

31813 **Hot air drum evaporator.** Black, R.L. (to Dept. of Energy). US Patent 4,305,780. 15 Dec 1981. Filed date 12 Nov 1980. vp.

PAT-APPL-206232.

An evaporation system for aqueous radioactive waste uses standard 30 and 55 gallon drums. Waste solutions form cascading water sprays as they pass over a number of trays arranged in a vertical stack within a drum. Hot dry air is circulated radially of the drum through the water sprays thereby removing water vapor. The system is encased in concrete to prevent exposure to radioactivity. The use of standard 30 and 55 gallon drums permits an inexpensive compact modular design that is readily disposable, thus eliminating maintenance and radiation build-up problems encountered with conventional evaporation systems.

31814 **Mixed convection in rectangular channel flow with smooth surfaces and one heated wall.** Christensen, R.N.; Gear, D.W.; Kulacki, F.A. (Ohio State Univ, Columbus). *American Society of Mechanical Engineers, [Paper];* No. 81-HT-6, vp(Aug 1981).

Temperature distributions and heat transfer coefficients are determined experimentally for flow conditions similar to those in proposed nuclear waste repositories. Investigations were performed for continuous and discrete heat flux distributions in one heated wall for Reynolds numbers between 1600 and 88,700. A correlation for Nusselt numbers is presented for the modeled flow regime for Reynolds numbers between 1600 and 88,700. 20 refs.

31815 **Volatility of some potential high-level radioactive waste forms.** Gray, W.J. (Pacific Northwest Laboratory, Richland, WA (USA)). *Radioactive Waste Management;* **1**: No. 2, 147-169(Sep 1980).

Volatilities of seven simulated high-level radioactive waste glasses, two supercalcines and one regular calcine, were determined in the range 1073 to 1573 K. The fission products Rb, Mo, Ru, Te and Cs were found in the vapor from all materials. In addition, the non-fission-product elements, B, Na and K, were vaporized from materials that contained them. There is a strong correlation between viscosity of the glasses and their volatility. Heats of vaporization of all volatile elements from the glasses are roughly the same and, therefore, the vapor compositions are nearly independent of temperature. This suggests that a single mechanism controls the vaporization rate of all elements in these complex multicomponent glasses. The two supercalcines were less volatile than any of the glasses, particularly when Cs losses were compared. Cs and Mo were the most volatile elements in the supercalcines while Cs was the single most volatile element in the other materials. Volatility of all the materials studied is significant only at temperatures above 1000 K but is negligible at waste storage temperatures.

0530 Environmental Aspects

REFER ALSO TO CITATION(S) 31795, 31801, 32534

31816 **(DOE/EV/03759—T1) Development of monitoring programs for ERDA owned radioactive low-level waste burial sites. Final report.** (Dames and Moore, White Plains, NY (USA)). Jul 1976. Contract AC01-76EV03759. 277p. NTIS, PC A13/MF A01. Order Number DE82002999.

The primary objective of this program was the development of generic monitoring program(s) applicable to the ERDA owned low level radioactive waste burial sites at Oak Ridge, Hanford, Savannah River, Los Alamos, and Idaho Falls. The monitoring program(s), when applied to a specific site, were to define the status of radionuclide migration, and assist in predicting future patterns of migration. To assist in defining the monitoring program, models were to be developed to simulate the movement of waterborne radionuclides from the burial locations as a function of site characteristics, geometry and time. The hydrogeologic and radiochemical characteristics of the ERDA owned sites were to be compiled and evaluated to establish the input required for applying the monitoring programs.

31817 **(PNL-SA—8992) In situ subterranean determination of actinides by high-resolution gamma-ray spectrometry.** Brodzinski, R.L. (Pacific Northwest Lab., Richland, WA (USA)). Apr 1981. Contract AC06-76RL01830. 14p. (CONF-810409—6; IAEA-SM—252/18). NTIS, PC A02/MF A01. Order Number DE82005903.

From IAEA international symposium on methods of low-level counting and spectrometry; Berlin, F.R. Germany (6 Apr 1981).

A system utilizing high resolution germanium diode gamma-ray spectroscopy for the simple, safe, and economical in situ determination of actinides is described. Six isotopes, ^{235}U, ^{238}U, ^{237}Np, ^{239}Pu, ^{241}Pu, and ^{241}Am, can be simultaneously measured at the 10 nCi g^{-1} level in less than 7 minutes. Collimators provide for measurement of horizontal strata as thin as 1 cm or solid angles as small as 0.1 steradians. Information obtainable with the system is discussed and compared to that obtainable with neutron activation/detection systems.

31818 **(PNL-SA—9503) Use of controlled release herbicides in waste burial sites.** Burton, F.G.; Cataldo, D.A.; Cline, J.F.; Skiens, W.E. (Pacific Northwest Lab., Richland, WA (USA)). Jul 1981. Contract AC06-76RL01830. 17p. (CONF-810765—2). NTIS, PC A02/MF A01. Order Number DE82006167.

From 8. international symposium on controlled release of bioactive materials; Fort Lauderdale, FL, USA (26 Jul 1981).

Controlled-release formulations of herbicides have been applied to the soil in the manner traditional for herbicides: on the surface or mixed into the top few inches of soil. The controlled-release formulation allows another option that we propose to use: to place herbicides, contained in controlled-release formulations, in a layer at least a foot below the surface of the soil, in order to prevent root penetration below that level. Ideally, the herbicide will prevent root tip cell division but will not translocate within the plant, thus assuring that the plant will survive, preserving the ground cover. Trifluralin is one of the herbicides which does not translocate and was chosen for use in this study. A number of applications for this technology are possible; particularly in waste management. In the present studies, we used two different forms of polymeric carrier/delivery (PCD) systems to investigate the controlled release of herbicides. In the initial study, a sheet was made of homogeneous mixtures of an individual polymer and trifluralin. We made several of these sheets, using a different polymer each time (with trifluralin) to compare release rates from the various polymers. We also fabricated cylindrical pellets in two sizes from mixtures of Profax/sup a/ PS-1600 polypropylene and trifluralin, formulated to determine the interaction of PCD systems with soil. Also developed is a trifluralin-releasing device with a theoretical effective lifetime approaching 100 years. The system was designed specifically to protect the asphalt layer or clay/aggregate barriers on uranium mill tailings piles. PCD devices composed of pellets could also be implanted over burial sites for radioactive and/or toxic materials, preventing translocation of those materials to plant shoots, and thence into the biosphere.

0540 Health And Safety

REFER ALSO TO CITATION(S) 31797, 31801, 32534, 32580

0550 Regulations

31819 **(LA—8870-PR) Nuclear safeguards research and development. Program status report, October 1980-January 1981.** Henry, C.N. (comp.). (Los Alamos National Lab., NM (USA)). Nov 1981. Contract W-7405-ENG-36. 81p. NTIS, PC A05/MF A01. Order Number DE82007014.

This report presents the status of the Nuclear Safeguards Research and Development Program pursued by the Energy, Chemistry-Materials Science, and Operational Security/Safeguards Divisions of the Los Alamos National Laboratory. Topics include nondestructive assay technology development and applications, international safeguards systems. Also discussed are training courses, technology transfer, analytical chemistry methods for fissionable materials safeguards, the Department of Energy Computer Security Technical Center, and operational security.

31820 **(LA—9002-MS) Neutron measurement techniques for the nondestructive analysis of irradiated fuel assemblies.** Phillips, J.R.; Bosler, G.E.; Halbig, J.K.; Klosterbuer, S.F.; Lee, D.M.; Menlove, H.O. (Los Alamos National Lab., NM (USA)). Nov 1981. Contract W-7405-ENG-36. 51p. NTIS, PC A04/MF A01. Order Number DE82007013.

Nondestructive measurement of the passive neutron signatures of irradiated light-water reactor fuel assemblies is a rapid and simple technique for verifying operator-declared exposure values. Fuel assemblies from four different reactor facilities have been measured to establish the functional relationship between the operator-declared exposure values and the experimentally measured neutron emission rates. Experimentally measured neutron emission rates of small fuel rod sections have been shown to agree with the predicted results from our calculational model. Destructive results for the actinide isotopes also agreed very well with our prediction.

Neutron emission rates varied by 30 to 40% between opposite corners of the source fuel assembly. Symmetrical neutron detector systems that measure all sides simultaneously were evaluated.

06 FUSION FUELS

0602 Processing

31821 **(IPP—4/188) Pellet production methods for fueling fusion devices.** Riedmueller, W. (Max-Planck-Institut fuer Plasmaphysik, Garching (Germany, F.R.)). Oct 1980. 20p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82780272.

A review is given of the methods developed for producing and positioning hydrogen isotope pellets which are used for filling magnetic confinement machines. Composite pellets used in inertial confinement (i.e. laser fusion) experiments are not considered in this review.

31822 **(UCRL—86160) Magnetron co-sputtering system for coating ICF targets.** Hsieh, E.J.; Meyer, S.F.; Halsey, W.G.; Jameson, G.T.; Wittmayer, F.J. (Lawrence Livermore National Lab., CA (USA)). 9 Sep 1981. Contract W-7405-ENG-48. 17p. (CONF-811113—48). NTIS, PC A02/MF A01. Order Number DE82006926.

From American Vacuum Society national symposium; Anaheim, CA, USA (3 Nov 1981).

Fabrication of Inertial Confinement Fusion (ICF) targets requires deposition of various types of coatings on microspheres. The mechanical strength, and surface finish of the coatings are of concern in ICF experiments. The tensile strength of coatings can be controlled through grain refinement, selective doping and alloy formation. We have constructed a magnetron co-sputtering system to produce variable density profile coatings with high tensile strength on microspheres.

31823 **Sputter coating of microspherical substrates by levitation.** Hosford, C.D.; Lowe, A.T. (to Department of Energy). US Patent 4,302,311. 24 Nov 1981. Filed date 19 Nov 1979. vp.

PAT-APPL-095681.

Microspheres are substantially uniformly coated with metals or nonmetals by simultaneously levitating them and sputter coating them at total chamber pressures less than 1 torr. A collimated hole structure comprising a parallel array of upwardly projecting individual gas outlets is machined out to form a dimple. Glass microballoons, which are particularly useful in laser fusion applications, can be substantially uniformly coated using the coating method and apparatus.

07 ISOTOPE AND RADIATION SOURCE TECHNOLOGY

0701 Physical Isotope Separation

31824 (GSI—81-2, pp 370) **Status report on the HELIOS system.** Mazumdar, A.K.; Wagner, H.; Walcher, W.; Bruegger, M.; Trautmann, N.; Ziegert, W. Mar 1981. NTIS (US Sales Only), PC A16/MF A01.

In Scientific report 1980.

31825 **(MLM—2884) Mound Facility activities in chemical and physical research: January-June 1981.** (Mound Facility, Miamisburg, OH (USA)). 15 Dec 1981. Contract AC04-76DP00053. 35p. NTIS, PC A03/MF A01. Order Number DE82006218.

Progress is reported on: reaction rates of deuterium-tritium mixtures (measured at several pressures at RT), low-temperature trennschaukel (for thermal diffusion of binary gas mixtures), liquid-phase thermal diffusion (^{35}Cl-^{37}Cl separation using methyl chloride, and ^{79}Br-^{81}Br separation using bromobenzene), Ca isotope separation (^{40}Ca-^{48}Ca separation by thermal diffusion of $Ca(NO_3)_2$ solution, calcium chemical exchange (chromatography of ^{48}Ca, ^{44}Ca), mutual diffusion (of Ar-Ne), molecular beam scattering (neon dimer experiments), and NMR studies of hydrogen diffusion in $TiCr_2H$/sub x/. (DLC)

08 HYDROGEN

0801 Production

REFER ALSO TO CITATION(S) 32212

0803 Transport

REFER ALSO TO CITATION(S) 31771

0806 Industrial And Commercial Use

REFER ALSO TO CITATION(S) 31840

09 OTHER SYNTHETIC AND NATURAL FUELS

0901 Hydrocarbon Fuels

REFER ALSO TO CITATION(S) 31722, 31830, 31836, 31844, 31849, 32305

31826 **Carbon number distribution of Fischer-Tropsch products formed on an iron catalyst in a slurry reactor.** Satterfield, C.N.; Huff, G.A. Jr. (Massachusetts Inst. of Tech., Cambridge). *Journal of Catalysis;* **73**: No. 1, 187-197(Jan 1982).

Studies at 234 to 269°C and at 790 kPa showed a precise linear relationship between the log of mole fraction m/sub n/ of products of carbon number n, and n, as predicted by the Flory molecular-weight distribution provided that all products, including oxygenated species, are considered. The relationship held over more than four orders of magnitude of m/sub n/, values of n of from 1 to about 20, and over a wide range of gas composition. The chain growth probability factor, α, increased slightly from 0.67 at 269°C to 0.71 at 234°C. 8 figures, 1 table.

0900 OTHER SYNTHETIC AND NATURAL FUELS

0901 Hydrocarbon Fuels

31827 **Hydrogenation of carbon monoxide over rhodium oxide surfaces.** Watson, P.R.; Somorjai, G.A. (Lawrence Berkeley Lab., CA). *Journal of Catalysis;* **72**: No. 2, 347-363(Dec 1981).

Hydrated and anhydrous rhodium oxides, Rh_2O_3 $5H_2O$ and Rh_2O_3 crystallites, were used as catalysts for the hydrogenation of CO at 6 atm and in the range of 250 to 350°C. The anhydrous oxide reduced to metallic rhodium rapidly, while the hydrated oxide was quite stable under the reaction conditions. The hydrated oxide produces a high concentration of oxygenated hydrocarbons, mostly acetaldehyde in addition to C_2 to C_6 alkenes and methane, in contrast to the unsupported metal which is a mediocre methanation catalyst. The activation energy for the formation of all of the products is 26 +- 2 kcal/mole indicating that they are likely to be produced from a common precursor intermediate, C/sub x/H/sub y/. The addition of ethylene to CO and H_2 results in the conversion of the olefin to propionaldehyde. This carbonylation reaction was not observed on the rhodium metal. The slower rates of hydrogenation on the oxide and its ability to insert CO into the C/sub t/H/sub y/ intermediates appear to be responsible for the changed product distribution in the CO/H_2 reaction. Electron spectroscopy studies indicate the presence of patches of oxide and metal both participate in the reaction and control the production distribution.

31828 **Future distillate fuels: what, when, where, and how stable.** Brinkman, D.W. (Bartlesville Energy Technology Center, OK); White, E.W. *American Society for Testing and Materials, Special Technical Publication;* No. 751, 84-91(1981). (ASTM-STP—751; CONF-8006225—).

From American Society for Testing and Materials symposium on petroleum products and lubricants; Chicago, IL, USA (24 Jun 1980).

While there are several alternative sources of middle distillate fuels, each has its own problems and limitations. Storage and thermal stability will become increasingly important as liquids from coal and shale become a part of the commercial stream. Stability testing implies that the severity of processing required will be controlled by the level of stability specified.

0902 Alcohol Fuels

REFER ALSO TO CITATION(S) 31836, 31840, 31840, 31841, 31845, 31846, 31847, 31854

31829 **(LBL—13669) Enzymatic hydrolysis of cellulose: theory and applications.** Wilke, C.R.; Maiorella, B.; Sciamanna, A.; Tangnu, K.; Wiley, D.; Wong, H. (Lawrence Berkeley Lab., CA (USA)). Jun 1980. Contract W-7405-ENG-48. 172p. NTIS, PC A08/MF A01. Order Number DE82005626.

A large amount of research has been published on the theory of enzymatic hydrolysis and the various microbial, and other, sources of the enzymes. The present report endeavors to supplement this information by emphasizing insofar as possible the status of the technology and of potential industrial processes for production of sugars from cellulose. A substantial research effort on cellulose conversion has been underway in the authors' laboratories at the University of California at Berkeley over the past ten years. This report is based in part upon this background of experience, and experimental data from relatively recent studies are presented in certain sections to make the information as timely and useful as possible. Because of current interest in production of ethanol a section is included which summarizes various methods for high productivity fermentation systems. Chapter titles are: Theory of enzymatic hydrolysis; production of cellulase and xylanase; hydrolysis of agricultural residues, enzymatic hydrolysis processes, high productivity ethanol fermentation; and ethanol economics. (DMC)

31830 **Methane and methanol synthesis over supported palladium catalysts.** Fajula, F.; Anthony, R.G.; Lunsford, J.H. (Texas A & M Univ., College Station). *Journal of Catalysis;* 73: No. 2, 237-256(Feb 1982).

Hydrogenation of carbon monoxide has been studied between 260 and 340°C and 5 and 50 atm of pressure over palladium supported on three different silicas and on HY and NaY zeolites. Fresh and used catalysts were characterized by chemisorption, temperature-programmed desorption, x-ray diffraction, electron microscopy, and photoelectron spectroscopy studies. The selectivity and the activity of the catalysts are strongly dependent on the nature of the support and on the state of the metal on its surface. Methanol is produced on the catalysts exhibiting small size crystallites on which CO is weakly adsorbed, whereas the formation of methane is directly related to the density of acidic sites at the surface of the support. Under the experimental conditions the palladium undergoes structural and electronic modifications due to transformations into hydride phases. These transformations lead to a cracking of the metal crystallites and to changes in the reaction rate expressions. 7 figures, 7 tables.

0903 Inorganic Hydrogen Compound Fuels

31831 **(PNL-SA—9057) Use of ammonia in energy-related applications.** Bomelburg, H.J. (Pacific Northwest Lab., Richland, WA (USA)). Apr 1980. Contract AC06-76RL01830. 22p. (CONF-8110146—1). NTIS, PC A02/MF A01. Order Number DE82006163.

From 26. symposium on safety in ammonia plants and related facilities; Montreal, Canada (4 Oct 1981).

The main purpose of this study was to check whether any of the new schemes for using ammonia in energy-related applications would generate adverse environmental control problems. Our preliminary conclusions are that there are no major problems anticipated which might be insoluble or differ greatly from those already being managed successfully by the ammonia industry today. Therefore, it might not be inconceivable that ammonia could become a large-scale and important contributor to the future energy budget.

13 HYDRO ENERGY

1303 Plant Design And Operation

31832 **(DOE/ID/12200—T1) Powerhouse-gate: concept definition study.** Mayo, H.A. Jr. (Allis-Chalmers Corp., York, PA (USA). Hydro-Turbine Div.). 30 Nov 1981. Contract FC07-80ID12200. 110p. NTIS, PC A06/MF A01. Order Number DE82006226.

The purpose of this investigation is to explore the potential for economical development of ultra low-head sites using an innovative concept known as the Powerhouse-gate (PHG). This concept combines the benefits of standardized hydroelectric generating units and shop fabrication of a structural steel powerhouse which, when in normal operating position, serves as a gate to replace conventional gates and can be raised as a complete assembly above flood levels so that existing structures may be used for the designed spillway purposes. The following are considered: a head range of from 6 to 10 ft; powerhouses including 1, 3, or 4 turbines; structural analysis of the basic powerhouse (3 units) concept without dynamic hydraulic loads; and powerhouse cost and economic evaluation. A detailed computer analysis of the structure with appropriate minor revisions confirmed its structural adequacy and suitability for the application. Estimates of the structure fabrication cost with the addition of standard turbines indicates the potential economic feasibility of the concept. It is felt the results to date justify further application studies which will potentially provide a basis for selecting a specific site demonstration project. Further studies will be necessary to analyze the interface impacts with existing structures and dynamic operating characteristics. (LCL)

14 SOLAR ENERGY

REFER ALSO TO CITATION(S) 32082

1401 Resources And Availability

REFER ALSO TO CITATION(S) 31867

1403 Economics

REFER ALSO TO CITATION(S) 31856

31833 **(PB—82-135260) FEDSOL: economic optimization guide for solar federal buildings projects. Model-simulation.** Powell, J.W.; Rodgers, R.C. Jr.; Barnes, K.A. (National Bureau of Standards, Washington, DC (USA)). 1981. mag tape, vp. National Bureau of Standards, Washington, DC.

The FEDSOL program determines the economically optimal size of a solar energy system for a user-specified building, location, system type, and set of economic conditions; it conducts numerous breakeven and sensitivity analyses; and it calculates measures of economic performance as required under the Federal Rules. The economic model in the program is linked with the SLR (Solar Load Ratio) design method developed at Los Alamos National Laboratory to predict the performance of active systems. The economics portion of the program can, however, be used apart from the SLR method, with performance data provided by the user. An environmental data file for 243 U.S. cities is included in the program. Highly user oriented, the FEDSOL program is intended as a design and sizing tool for use by architects, engineers, and facilities managers in developing plans for Federal solar energy projects...Software Description: The program is written in the BASIC programming language for implementation on a CYBER

170/720 computer using the NOS Level 531 operating system. 47K bytes of core storage are required to operate the model.

31834 **(SAND—81-7027) Photovoltaics and electric utilities.** Bright, R.; Leigh, R.; Sills, T. (Brookhaven National Lab., Upton, NY (USA)). Dec 1981. Contract AC04-76DP00789. 205p. NTIS, PC A10/MF A01. Order Number DE82006994.

The long term value of grid connected, residential photovoltaic (PV) systems is determined. The value of the PV electricity is defined as the full avoided cost in accordance with the Public Utilities Regulatory Policies Act of 1978. The avoided cost is computed using a long range utility planning approach to measure revenue requirement changes in response to the time phased introduction of PV systems into the grid. A case study approach to three utility systems is used. The changing value of PV electricity over a twenty year period from 1985 is presented, and the fuel and capital savings due to FY are analyzed. These values are translated into measures of breakeven capital investment under several options of power interchange and pricing.

1404 Environmental, Legal, And Institutional Aspects

REFER ALSO TO CITATION(S) 31730, 31873

1405 Solar Energy Conversion

REFER ALSO TO CITATION(S) 31829, 31877, 32105, 32307

31835 **(CONF-810865—10) Development of a pressurized biomass gasification process.** Babu, S.P.; Onischak, M. (Institute of Gas Technology, Chicago, IL (USA)). Aug 1981. Contract AC02-80CS83004. 9p. NTIS, PC A02/MF A01. Order Number DE82902128.

From Solar world forum; Brighton, UK (23 Aug 1981).

The development of a single-stage pressurized fluidized-bed steam-oxygen gasification process for forest and crop residues and wastes is described. The objective of the program is to produce medium-Btu gas (MBG) or synthesis gas. Process and design support work is also described. This includes bench-scale devolatilization and char gasification studies along with the determination of biomass handling, drying, and fluidization characteristics.

31836 **(CONF-820217—4) Biothermal conversion of biomass to methane and alcohols.** Chynoweth, D.P.; Srivastava, V.J.; Jerger, D.E.; Tarman, P.B. (Institute of Gas Technology, Chicago, IL (USA)). 1982. 20p. Institute of Gas Technology, 3424 South State Street, IIT Center, Chicago, IL 60616.

From 9. energy technology conference; Washington, DC, USA (16 Feb 1982).

Current studies at IGT are evaluating combinations of biological and thermal processes that can be used to convert all types of biomass to methane or alcohol fuels. One process under development for the production of methane employs anaerobic digestion followed by thermal gasification. High- or low-mositure-content feeds are subjected to anaerobic digestion andthe refractory nonbiodegradable residues are dewatered and thermally gasified. Nutrients produced in the thermal gasification step are recycled to enhance the bioconversion step. The bioconversion step is also used to clean and upgrade the thermally-produced synthesis gas by biomethanation. In addition, the synthesis gas provides a means for heating, mixing, and stimulation of methanogenesis in the bioconversion step. The process is cost-competitive and has a thrmal efficiency superior to other processes. Another process under study combines fermentation with thermal conversion for production of separate streams of ethanol and methanol. This process employs fermentation for production of ethanol, and thermal conversion of fermentation residues for production of synthesis gas and methanol. Thermal process heat and a portion of the synthesis gas are used to supply the energy required for feed pretreatment, fermentation, and alcohol purification. The output of alcohol (ethanol plus methanol) is approximately double that obtained by conventional fermentation processes.

31837 **(DFE—35) Competitive capability of energy crops for arable land.** (Delegationen foer Energiforskning, Stockholm (Sweden)). 1981. 36p. (In Swedish). NTIS (US Sales Only), PC A03/MF A01. Order Number DE82900992.

Different types of crop as energy source compete for the soil with crops for food. The profitability of various types of crop is compared to each other, and the production of biomass as energy source is assessed. The calculated yield is presented in SEK per hectare. At the present price of oil, the utilization of forest energy and straw is more profitable than to grow crops for energy. It is concluded that research and development may make biomass competitive for heat production.

31838 **(DOE/JPL—1012-61) Sensitivity analysis of the add-on price estimate for the silicon web growth process.** Mokashi, A.R. (Jet Propulsion Lab., Pasadena, CA (USA)). 15 Dec 1981. Contract AI01-76ET20356. 34p. NTIS, PC A03/MF A01. Order Number DE82005812.

The web growth process is a silicon-sheet technology option that is being developed for the Flat-Plate Solar Array (FSA) Project. In order to achieve the FSA price goal of $0.70/W/sub p/, certain required production-rate and sheet-quality standards must be met. Based on research and development experience, base-case data for the technical and cost parameters that could be achieved for the technical and commercial readiness phase of the FSA project are projected. A sensitivity analysis of the process add-on price is presented, using the base-case data in terms of cost parameters such as equipment, space, direct labor, materials and utilities, and the production parameters such as growth rate and run length, using a computer program developed specifically to do the sensitivity analysis with Improved Price Estimation Guidelines. The sensitivity analysis is also performed with respect to silicon price, sheet thickness and cell efficiency.

31839 **(DOE/R5/10222—1) Microorganisms for fermentation of crop residues. Final technical report.** Eddleman, H. (Indiana Biolab, Palmyra (USA)). 1981. Contract FG02-80R510222. 2p. NTIS, PC A02/MF A01. Order Number DE82006912.

The construction of a device for freeze drying cultures and the accumulation of about 200 fungi which decompose cornstalks are described. (MHR)

31840 **(DOE/TIC—2006904) Alcohol fuels program technical review.** (Solar Energy Research Inst., Golden, CO (USA)). Sum 1981. Contract AC02-77CH00178. 97p. NTIS, PC A05/MF A01. Order Number DE82006904.

The last issue of the Alcohol Fuels Process R/D Newsletter contained a work breakdown structure (WBS) of the SERI Alcohol Fuels Program that stressed the subcontracted portion of the program and discussed the SERI biotechnology in-house program. This issue shows the WBS for the in-house programs and contains highlights for the remaining in-house tasks, that is, methanol production research, alcohol utilization research, and membrane research. The methanol production research activity consists of two elements: development of a pressurized oxygen gasifier and synthesis of catalytic materials to more efficiently convert synthesis gas to methanol and higher alcohols. A report is included (Finegold et al. 1981) that details the experimental apparatus and recent results obtained from the gasifier. The catalysis research is principally directed toward producing novel organometallic compounds for use as a homogeneous catalyst. The utilization research is directed toward the development of novel engine systems that use pure alcohol for fuel. Reforming methanol and ethanol catalytically to produce H_2 and CO gas for use as a fuel offers performance and efficiency advantages over burning alcohol directly as fuel in an engine. An application of this approach is also detailed at the end of this section. Another area of utilization is the use of fuel cells in transportation. In-house researchers investigating alternate electrolyte systems are exploring the direct and indirect use of alcohols in fuel cells. A workshop is being organized to explore potential applications of fuel cells in the transportation sector. The membrane research group is equipping to evaluate alcohol/water separation membranes and is also establishing cost estimation and energy utilization figures for use in alcohol plant design.

31841 **(EGG-M—04481) Design for a small-scale fuel-alcohol plant.** Berglund, G.R.; Richardson, J.G. (EG and G Idaho, Inc., Idaho Falls (USA)). Jun 1981. Contract AC07-76ID01570. 36p. (CONF-811108—15). NTIS, PC A03/MF A01. Order Number DE82006215.

From Annual meeting of the Institute of Chemical Engineers; New Orleans, LA, USA (8 Nov 1981).

The design of a small scale fuel alcohol plant 100 L/h (26.4 gal/h) of 95% (190 proof) ethanol is presented. The plant was designed and constructed using commercially available equipment. The object was to provide an energy efficiency and economical feasible reference design of a small scale fuel alcohol plant. The design requirements of the plant are presented. Each subsystem is described in detail. The systems discussed are feedstock handling and preparation; cooking and saccharification fermentation, distillation, and the automatic control system. Also discussed are test results, and costs.

31842 **(NP—2901104) Use of the biomass of black pine (Pinus nigra arn.) and locust (Robinia Pseudoacacia L.) as raw material for chip boards in consideration of whole-tree harvesting.** Amri, A. (Freiburg Univ. (Germany, F.R.)). 19 Nov 1979. 152p. (In German). NTIS (US Sales Only), PC A08/MF A01. Order Number DE82901104.

Thesis.

In the locust and black pine forests of the forestry office of Breisach near Freiburg, trees have been randomly cut, and the biomass has been classified qualitatively and quantitatively. Trial chip boards have been made of this material which were then tested and judged for their qualitative properties according to DIN standards.

31843 **(NP—2901471) Economics of crop and forest biomass for energy.** Hitzhusen, F.J. (Ohio State Univ., Columbus (USA). Dept. of Agricultural Economics and Rural Sociology). 1979. 4p. NTIS, PC A02/MF A01. Order Number DE82901471.

The economic feasibility of using corn stoves as a coal supplement in coal burning steam-electric power plants in the North Central United States is discussed briefly. (MHR)

31844 **(NP—2901472) Agricultural anaerobic digesters: design and operation.** Persson, S.P.E.; Bartlett, H.D.; Branding, A.E.; Regan, R.W. (Pennsylvania State Univ., University Park (USA). Agricultural Experiment Station). Nov 1979. 56p. NTIS, PC A04/MF A01. Order Number DE82901472.

The following are discussed: microbial and chemical processes, design and function of the digester system, operational procedure, storage and use of biogas and effluent, and costs of anaerobic digestion and biogas production from dairy barn manure. (MHR)

31845 **(NP—2902045) Workshop on ethanol as an alternative source of fuels.** (National Academy of Sciences, Washington, DC (USA). Board on Science and Technology for International Development). Jan 1981. 51p. CIR/BOSTI, National Academy of Sciences, 2101 Constitution Ave., Washington, DC 20418.

The workshop proceedings included opening addresses by several officials and working group discussions on the following: agriculture and agronomy, technology and engineering, economics and marketing, and transmigration and social impacts. Two presentations were abstracted separately. (MHR)

31846 (NP—2902045, pp 19-24) **Propsects for ethanol in Indonesia.** Wasito, K. (Agency for the Development and Application of Technology, Indonesia). Jan 1981. CIR/BOSTI, National Academy of Sciences, 2101 Constitution Ave., Washington, DC 20418.

In Workshop on ethanol as an alternative source of fuels.

The following are discussed: energy farming, the position of alcohol fuels in the long-term forecast for energy demand and supply in Indonesia, development of an ethanol pilot plant, and long-term planning for ethanol production. (MHR)

31847 (NP—2902045, pp 25-28) **Economics of ethanol in Indonesia.** Soetono, H. Jan 1981. CIR/BOSTI, National Academy of Sciences, 2101 Constitution Ave., Washington, DC 20418.

In Workshop on ethanol as an alternative source of fuels.

Energy consumption and needs are discussed. The economics of current alcohol production is presented. An analysis is given which shows that substitution of alcohol fuel for petroleum is profitable for Indonesia. (MHR)

31848 **(ORNL/MIT—336) Preparation and characterization of β-D-glucosidase immobilized in calcium alginate.** Krasniak, S.R.; Smith, R.D. (Massachusetts Inst. of Tech., Oak Ridge, TN (USA). School of Chemical Engineering Practice). Jan 1982. Contract W-7405-ENG-26. 35p. NTIS, PC A03/MF A01. Order Number DE82006978.

Enzymatic hydrolysis of biomass to produce glucose may become feasible if an inexpensive method to reuse the enzyme can be found. This study investigated one such method whereby β-D-glucosidase (E.C. 3.2.1.21) was immobilized in calcium alginate gel spheres, which were shown to catalyze the hydrolysis of cellobiose to glucose. There was a loss of 49% of the enzyme from the alginate slurry during gelation. After gelation, in the stable gel spheres, there was a 37% retention of the enzyme activity that was actually immobilized. The reason for the loss in activity was investigated and may be caused by inhibition of the enzyme within the sphere by the calcium cations and the alginate anions also present. Mass transfer effects were minimal in this system and were not responsible for the activity loss.

31849 **(PNL-SA—9975) Treatment of biomass gasification wastewaters using wet air oxidation, solvent extraction, and reverse osmosis.** Petty, S.E.; Bell, N.E.; English, C.J. Jr. (Pacific Northwest Lab., Richland, WA (USA)). Oct 1981. Contract AC06-76RL01830. 30p. (CONF-8110115—2). NTIS, PC A03/MF A01. Order Number DE82005224.

From 13. biomass thermochemical conversion contractors meeting; Washington, DC, USA (27 Oct 1981).

Biomass gasification wastewaters (BGW) from Texas Tech University's biomass gasifier were treated using wet air oxidation (WAO), solvent extraction, and reverse osmosis (RO) technologies. These technologies were reviewed to determine if they could be competitive or complimentary to innovative biological technologies studied earlier. Results obtained from experimental studies completed on these three technologies during the past year are reviewed. Wastewaters treated by WAO exhibited chemical oxygen demand (COD) removal percentages ranging from 0% at 5.1 MPa (750 psi) and 150°C to 85% removal at 13.8 MPa (2000 psi) and 300°C. Oxidation times varied from 20 to 180 minutes, although it was determined that the removal of COD became less dependent on reaction time as the severity of treatment conditions was increased. Color removal using WAO ranged from 56 to 99%. Solvent extraction studies indicate that none of the conventional solvents (i.e., methyl isobutyl ketone, n-butyl acetate, n-butanol, kerosene, toluene, tributyl phosphate, tri-n-octyl phosphine oxide, and mixtures of these compounds) are effective in the removal of organics; the best distribution coefficient of 1.3 was given by n-butanol. Hence, solvent extraction is probably not an effective treatment technology for BGW. RO studies on biologically treated BGW indicate 99.7 to 99.8% of the initial COD (~ 7000 mg/l) can be removed from these wastewaters. Essentially total removal of color was also observed.

31850 **(PNL-SA—9982) Pacific Northwest biomass as an energy resource.** Chockie, A.D. (Pacific Northwest Lab., Richland, WA (USA)). Nov 1981. Contract AC06-76RL01830. 13p. (CONF-811212—11). NTIS, PC A02/MF A01. Order Number DE82005804.

From 4. international conference on alternative energy sources; Miami Beach, FL, USA (14 Dec 1981).

A review of the biomass resource base in the Northwest scenarios and a preliminary analysis of the issues involved in the collection and use of forest residues as an energy resource are presented.

31851 (SERI/PR—8143-1-T5) Development of copper sulfide/cadmium sulfide thin-film solar cells. Szedon, J.R.; Dickey, H.C.; Abel, J.A.; Biter, W.J. (Westinghouse Electric Corp., Pittsburgh, PA (USA). Research and Development Center). 5 Nov 1981. Contract AC02-77CH00178. 43p. NTIS, PC A03/MF A01. Order Number DE82005254.

Means were explored to better control wet-chemistry conditions attending formation of the Cu_xS layer on CdS-based solar cells. Dilution of active solutions in contact with the Cu_xS layer results in poorer cell performance. Use of an argon gas knife to dry the cell surface after etching, barrier formation, and rinsing allows greater control of process conditions and gives good cell results. Electroplating offers a promising low-cost alternative to evaporation of gold-grid electrodes. Cells with plated grids were significantly higher in efficiency than control cells with evaporated grids.

31852 (SERI/PR—9195-1-T3) Improved amorphous Si solar cells. Quarterly progress report No. 5, February 1-April 30, 1981. Dalal, V. (Solar Energy Research Inst., Golden, CO (USA); Delaware Univ., Newark (USA). Inst. of Energy Conversion). Nov 1981. Contract AC02-77CH00178. 37p. NTIS, PC A03/MF A01. Order Number DE82006886.

Both n and p-type a-Si:H films with very high conductivities have been grown by diluting SiH_4 in Ar or H_2. These films have Fermi levels close to the conduction and valence bands (0.03 eV). The use of these heavily doped films as p^+ and n^+ junction layers in a p^+in^+ cell should increase the diffusion voltage of the diode, thereby increasing both J/sub sc/ and V/sub oc/. The analysis of conductivity and thermoelectric power on films of diverse thickness have revealed no systematic changes. However, the drift mobility shows a systematic increase with thickness. The analysis of cells by studying quantum efficiency vs. applied voltage has revealed the electron (μ tau) product is limiting transport in nip cells and not the hole (μ tau) product. Analysis reveals that typically (μ tau)/sub eta/ = 10^{-9} cm^2/V. A new device design, Tandem parallel-connected cells, has been evolved to improve the current collection in a-Si cells. This design may help increase J/sub sc/ to 15 to 16 mA/cm^2 in a-Si:H.

31853 (SERI/TP—211-1494) Enhanced stability of photoelectrodes with electrogenerated polyaniline films. Noufi, R.; Nozik, A.J.; White, J.; Warren, L.F. (Solar Energy Research Inst., Golden, CO (USA); Rockwell International Corp., Thousand Oaks, CA (USA)). Jan 1982. Contract AC02-77CH00178. 17p. (CONF-811013—16). NTIS, PC A02/MF A01. Order Number DE82007001.

From Electrochemical Society conference; Denver, CO, USA (11 Oct 1981).

Polyaniline was electrodeposited on platinum and semiconducting (Cd-chalcogenides, Si, GaAs, GaP) electrodes from aqueous solution (pH = 1) containing aniline. The electrochemical behavior of such films was examined in aqueous and nonaqueous solutions by cyclic voltametry. Results show that the polyaniline film is conducting in both cathodic and anodic regions at pH < 3 as evidenced by the electrochemical redox reactions of various redox couples on polyaniline-coated electrodes. In general, all polyaniline-coated semiconductor electrodes examined exhibited enhanced stability of the photocurrent when compared to that of the naked electrodes.

31854 Literature survey of intermediate products formed during the thermal aqueous degradation of cellulose. Molton, P.M.; Demmitt, T.F. (Battelle Pacific Northwest Labs., Richland, WA). *Polymer-Plastics Technology and Engineering;* **11**: No. 2, 127-157(1978). Contract EY-76-C-06-01830.

Thermochemical liquefaction is the process whereby solid organic material is converted to liquid, char, and gas by the action of aqueous media, often containing an alkali or alkaline earth metal salt as catalyst. The overall chemical reaction mechanisms involved in the degradation of cellulose are very poorly understood. Cellulose is degraded by heat and water. Alkali can carve a reducing terminal enediol rearrangement and end-group cleavage (scissoring) in the cellulose molecule. Traces of oxygen stabilize the cellulose molecule to this form of degradation. Further degradation of the glucose units may occur with the formation of D-glucoiso-and metasaccharine acids, which themselves are degraded further to simple acids such as glycolic and 3,4-dihydroxybutyric acids. Beyond this step, the reaction leading to the formation of high molecular weight oils and tars are completely unknown. It is not even known if the oils and tars are formed from cellulose in separate reactions, together, via simple degradation products, or by a combination of these events. 4 figures, 9 tables. (DP)

1406 Photovoltaic Power Systems

REFER ALSO TO CITATION(S) 31834

31855 (DOE/ET/20279—153) Application, sizing, testing and performance of the photovoltaic battery subsystem at Natural Bridges National Monument, Utah. Brench, B.L. (Massachusetts Inst. of Tech., Lexington (USA). Lincoln Lab.). Nov 1981. Contract AC02-76ET20279. 50p. NTIS, PC A03/MF A01. Order Number DE82007040.

During the two years from 24 May 1978 to 7 June 1980, the battery subsystem for the 100-kW peak photovoltaic power system for Natural Bridges National Monument was designed, modified, tested, installed, retested and again modified. The subsystem includes 224 lead-acid (with calcium alloy) cells, hydrogen recombiners, an air-lift pump system and electrolyte level indicators. Problems and solutions related to these subsystem components are discussed. Further details concerning the battery selection, design, tests and performance throughout the battery's life are also included.

31856 (DOE/ET/20356—5) Normative price for energy from an electricity-generation system: an owner-dependent methodology for energy generation (system) assessment (OMEGA). Volume II. Derivation of system energy price equations. Chamberlain, R.G.; McMaster, K.M. (Jet Propulsion Lab., Pasadena, CA (USA)). 15 Oct 1981. Contract AI01-76ET20356. 102p. NTIS, PC A06/MF A01. Order Number DE82005808.

A generalization and updating is presented of the Utility-Owned Solar Electric System (USES) methodology, which is in widespread use throughout the energy generation systems analysis community. The major new contributions are these: (1) relaxation of the ownership assumption; (2) removal of the constraint that all systems compared must have the same system lifetime; (3) explicit treatment of residual system value at the end of system life. (removal of the assumption that all components within a system have lifetimes commensurate with the system lifetime); (4) explicit treatment of variations in system performance with time; (5) explicit treatment of tax incentives, including use of the investment as a tax shelter (tax incentives incorporated include investment tax credits, solar tax credits, property tax rates, accelerated depreciation, and capital gains); (6) incorporation of financial benefits of usable thermal energy, utility buy-back (in parallel or simultaneous mode) of excess electricity generated, capacity displacement and fuel savings credits, and, where appropriate, roof credits. The net present value of the system, viewed as an investment, is determined by consideration of all financial benefits and costs (including a specified return on investment). Along the way, life cycle costs, life cycle revenues, and residual system values are obtained. Break-even values of system parameters are estimated by setting the net present value to zero. While the model was designed for photovoltaic generators with a possible thermal energy byproduct, its applicability is not limited to such systems. The resulting Owner-dependent Methodology for Energy Generation system Assessment (OMEGA) consists of a few equations that can be evaluated without the aid of a high-speed computer. Volume II gives the complete derivation.

31857 (DOE/ET/29310—1) Investigation of a family of power conditioners integrated into the utility grid: Category 1. Residential power conditioner. Final report. Steigerwald, R.L.; Ferraro, A.; Tompkins, R.E. (General Electric Co., Schenectady, NY (USA)). Jul 1981. Contract AC02-80ET29310. 96p. NTIS, PC A05/MF A01. Order Number DE82007468.

The development of power conditioners for residential photovoltaic applications of approximately 5 to 30 kW is reported. The

interface of the inverter and the solar array, as well as the ac utility is investigated including the effects of array input current, utility impedance, and injected harmonic currents. The trade-off study of alternate power conversion schemes are covered which results in a recommended approach. A conceptual design of the recommended approach, including performance results obtained from an inverter simulated is presented. (LEW)

31858 **(SAND—81-0135-Rev.1) Bibliography of reports by the Sandia photovoltaic projects.** Allen, P.A. (ed.). (Sandia National Labs., Albuquerque, NM (USA)). Dec 1981. Contract AC04-76DP00789. 48p. NTIS, PC A03/MF A01. Order Number DE82007559.

Reports are included in the bibliography that cover photovoltaic systems definition and development, photovoltaic concentrator technology, and photovoltaic system application experiments, and within each of these categories, the citations are arranged by date, by author, and by document number. (LEW)

31859 **(SAND—81-7086/5) Intermediate photovoltaic system application experiment operational performance report. Volume 5. Newman Power Station Site, El Paso, TX.** (Sandia National Labs., Albuquerque, NM (USA); Boeing Computer Services Co., Seattle, WA (USA)). Dec 1981. Contract AC04-76DP00789. 35p. NTIS, PC A03/MF A01. Order Number DE82007566.

Performance data are given for a photovoltaic power supply at a Texas electric utility for the months of September and October 1981. The monthly and daily total electrical energy yield, monthly and daily total solar radiation incident, and the monthly and daily efficiency of the photovoltaic array are given. The energy production is graphed as a function of power level, voltage, cell temperature, and hour of the day. The daily system availability is graphed. The monthly and hourly insolation, monthly and hourly ambient temperature, and monthly and hourly wind speed are given, as are the total monthly heating and cooling loads and wind direction distribution. (LEW)

31860 **(SAND—81-7090/4) Intermediate photovoltaic system application experiment operational performance report. Volume 4 for Mt. Laguna Radar Station, Mt. Laguna, CA.** (Sandia National Labs., Albuquerque, NM (USA); Boeing Computer Services Co., Seattle, WA (USA)). Dec 1981. Contract AC04-76DP00789. 35p. NTIS, PC A03/MF A01. Order Number DE82007565.

Performance data are given for a radar station in California for the months of September and October, 1981. Monthly and daily energy production, monthly and daily incident radiation totals, and monthly and daily array field efficiencies are presented. Energy production is graphed as a function of power level, voltage, cell temperature, and hour of the day for each month. Power conditioner input, output, and efficiency are given for each month. The capacity factor is given. The daily availability is graphed for each month. Monthly insolation data, heating and cooling load, ambient temperature average for the month, wind speed and direction data, hourly cell temperature, ambient temperature, and hourly insolation data are presented. (LEW)

1407 Solar Thermal Power Systems

REFER ALSO TO CITATION(S) 31872

31861 **(DOE/SF/10763—T13) Solar energy systems simulation and analysis. 2nd quarterly progress report, January 1-March 31, 1980.** Vant-Hull, L.L. (Energy Foundation of Texas, Houston (USA); Houston Univ., TX (USA). Energy Lab.). 28 Apr 1980. Contract AC03-79SF10763. 9p. NTIS, PC A02/MF A01. Order Number DE82005369.

Progress is reported on the project to document the University of Houston Central Receiver optical analysis codes. Rapid progress is being made in generating user oriented archival versions of the codes and in documenting the NS Performance Code.

31862 **(DOE/SF/11436—1-Exect.Summ.) Solar central receivers: the technology, industry, markets, and economics.** (Booz, Allen and Hamilton, Inc., Bethesda, MD (USA)). 1 Sep 1981. Contract AC03-81SF11436. 68p. NTIS, PC A04/MF A01. Order Number DE82005296.

Solar central receiver (SCR) technologies are described and compared briefly with other solar thermal technologies. Divergence in the capabilities of SCR technical options and the fact that no single SCR technology has emerged as the best technology for all applications are discussed. The necessity for continued technical development of both components and systems is presented. The geographic segmentation of the addressable market for SCR technology is considered. Economics and market factors favorable to adoption of SCR technology in the mid-1990's are described. The ways the competitive economics of SCR technology and its adoption rate in the market place can be improved with the implementation of specific federal programs are pointed out. The ways a cohesive federal program can serve to advance the date of free market competition and create a sustainable SCR industry are discussed. (MHR)

31863 **(UCLA—12/1311) Environmental effects of solar thermal power systems: ecological observations during construction of the Barstow 10 MWe pilot STPS.** Turner, F.B. (ed.). (California Univ., Los Angeles (USA). Lab. of Biomedical and Environmental Sciences). Oct 1981. Contract AC03-76SF00012. 106p. NTIS, PC A06/MF A01. Order Number DE82005441.

The environmental monitoring plan used consists of comparisons of a few meteorological variables and changes in the states of a limited array of indicator species or assemblages of species of plants and animals. Observations inlude aerial photography of the site, saltation meter measurements downwind from the site to measure fluxes of windblown sand, measurements of airborne particulates and atmospheric pollutants, and baseline temperature profiles made at two sites near the heliostat field to measure micro-meteorological patterns. Observations were made of annual plants both in off-field plots and in heliostat field, of shrubs, birds, rodents, reptiles, and sensitive species listed as rare or endangered. (LEW)

1408 Ocean Thermal Gradient And Salinity Gradient Power Systems

31864 **(ANL/OTEC-BCM—023) OTEC biofouling, corrosion, and materials study from a moored platform at Punta Tuna, Puerto Rico.** Sasscer, D.S.; Tosteson, T.R.; Morgan, T.O. (Argonne National Lab., IL (USA); Center for Energy and Environment Research, Mayaguez (Puerto Rico)). Aug 1981. Contract W-31-109-ENG-38. 126p. NTIS, PC A07/MF A01. Order Number DE82007037.

During the 404 days between 29 January 1980 and 10 March 1981 the Center conducted an uninterrupted biofouling test at Punta Tuna, Puerto Rico, of periodically cleaned, OTEC evaporator tubes. The fouling resistance (R/sub f), total surface carbon and nitrogen content, ATP, and the wet film thickness (WFT) were determined throughout the test. Visual observations of the fouling film were made by light sectioning and scanning microscopy, and at the end of the test, a study was made of the macrofouling of the flow system. The results of thest tests indicate that a base layer of bacteria and exudated polysaccharides enhance microbial adhesion and thereby create an environment conducive to rapid film growth. Fouling rates (dR/sub f//dt) for aluminum were generally higher than for titanium but they were linear for both materials and did not exceed $0.3(10^{-4})ft^2\text{-}h\text{-}^0F/Btu$-day for either material during the 13-month study. Excellent correlation was found to exist between R/sub f/ and WFT which supports the hypothesis that it is the stagnant film of water entrapped by bacteria which is largely responsible for the insulating properties of the biofilm. The macrofouling study identified 61 species of benthic invertebrates representing ten phyla growing in those parts of the flow system, where flow was less than 3 fps but no macrofouling where the flow velocity significantly exceeded 3 fps.

31865 **(DOE/ET/21002—T21) Technical assessment of the prevention of micro-fouling on OTEC heat-transfer surfaces through the use of ultraviolet radiation.** Garrigan, G.A.; Schmitt, R.P.; Ciccone, V.J. (VSE Corp., Alexandria, VA (USA); Ciccone (V.J.) and Associates, Inc., Woodbridge, VA (USA)). Sep 1981. Contract AC02-78ET21002. 95p. NTIS, PC A05/MF A01. Order Number DE82005489.

To reduce or eliminate biofouling by microorganisms it has been suggested that the seawater entering the heat exchanger be sterilized (or at least sanitized) by uv radiation at 253.7 nm. The feasibility of applying this technology to OTEC is examined. Trivial calculations based on the Lambert-Beer equation and reasonable assumptions about seawater quality and the intensity of irradiation obtainable from a uv lamp suggest seawater may be transparent enough to a collimated beam of uv light to deliver effective germicidal doses to nearly 150 cm under some conditions. However, the practical limit on the depth of effective radiation from commercial lamps is severely restricted by many factors including the natural divergence of light, absorption and scattering in the media, intensity of radiation from the light source and so forth. Even under very favorable conditions a common design allowing uv light to penetrate 30 cm of water would have to permit the water at that distance to be in contact with the light for 20 seconds or so to deliver the germicidal effect of high quality sanitization but not necessarily sterilization. Macro-fouling, which may be more severe than micro-fouling, will not be affected by uv radiation (presuming an absence of symbiotic relationships). Parasitic power required for uv sources may be prohibitive under unfavorable conditions (i.e., unexpectedly high absorptivities of seawater, or excessive turbidity) or the absence of an industrial effort to scale up present uv equipment appropriate to OTEC needs. This latter event is unlikely for it appears that present uv lamps can be adapted to OTEC needs without major technological advancement. Power and cost estimates for uv installation and operation vary widely depending on the number of lamps needed for the OTEC configuration and the intensity of uv radiation actually required to prevent biofouling of heat transfer systems in OTEC designs.

1409 Solar Thermal Utilization

REFER ALSO TO CITATION(S) 31833, 32116

31866 **(BNL—30441) Analysis of selected surface characteristics and latent heat storage for passive solar space heating.** Fthenakis, V.; Leigh, R. (Brookhaven National Lab., Upton, NY (USA)). Dec 1981. Contract AC02-76CH00016. 16p. (CONF-811212—12). NTIS, PC A02/MF A01. Order Number DE82006932.

From 4. international conference on alternative energy sources; Miami Beach, FL, USA (14 Dec 1981).

Results are presented of an analysis of the value of various technical improvements in the solar collector and thermal storage subsystems of passive solar residential, agricultural, and industrial systems for two regions of the country. The evaluated improvements are: decreased emissivity and increased absorptivity of absorbing surfaces, decreased reflectivity, and decreased emissivity of glazing surface, and the substitution of sensible heat storage media with phase change materials. The value of each improvement is estimated by the additional energy savings resulting from the improvement.

31867 **(DTH-LV-MEDD—106) Incident solar radiation and solar heating systems -measured and calculated.** Lawaetz, H. (Research Establishment Risoe, Roskilde (Denmark)). Oct 1980. 208p. (In Danish). NTIS (US Sales Only), PC A10/MF A01. Order Number DE82900603.

Various methods for measuring the solar gain at the surface of the earth are decribed and evaluated. Formula expressions to calculate the incident angle of the direct solar radiation on a given surface are developed. A measuring equipment for continuos measurements of the solar radiation on seven surfaces is briefly described. From the measurements of the solar radiation and from the other meteorological weather observations, a new calculation method for the determination of the diffuse sky radiation on arbitrary surfaces from horizontally measured radiation has been made. The yearly solar gain in Denmark is discussed, and with the use of a new method for selecting a reference year such one is selected from 15 year's meteorological weather observations, and the distribution of the solar gain during the year is drawn. A mathematical model of a solar collector is examined. For some given solar collector designs and weather conditions it is demonstrated that the solar collector output calculated with the described model is in accordance with more complicated models. Formulas for calculating the collector output are supplied with developed expressions which consider the heat capacity in and the heat loss from the pipings between the solar collectors and the heat storage. The calculation expressions are used to built up a computer simulation model of a solar heating system. The calculated performance is compared to the measured and a good agreement is found. With the developed model and with the selected reference year it is possible to calculate the output we actually would get from a system correspondingly designed. Graphs for dimensioning domestic hot water system were drawn, and at the end a single economic optimisation of the size of the system was made.

31868 **(IG—114) Report on assessment of the national program for solar heating and cooling of commercial buildings.** (Department of Energy, Washington, DC (USA). Office of Inspector General). 12 May 1980. 27p. NTIS, PC A03/MF A01. Order Number DE82004554.

The management and effectiveness of demonstration projects that are part of the Department of Energy's (DOE's) National Program for Solar Heating and Cooling of Commercial Buildings are reported. A total of 18 solar applications projects were visited and information and views about the program were obtained by interviewing DOE program and project managers, NASA special technical managers, project owners, and representatives in the private sector supporting the DOE solar demonstration program. Problems are identified that, if allowed to persist, might tend to undermine public confidence in the future of solar energy. Even though each proposal for a demonstration project listed the theoretical amount of energy to be replaced by the installed solar system, there was no assurance that many of the installed systems were performing reasonably within the range of the predicted values. The Office of Solar Applications did not provide for adequate review of proposed system designs and project costs prior to awarding grand funds. Some demonstration projects were less than cost-effective because of excessive complexity or reliance on inaccurate demand forecasts. Several projects lacked diagnostic sensors that would have facilitated maintenance, and others proved uneconomic because of overestimates of hot water demand in the summer. Lessons learned from solar commercial demonstration projects were not always effectively communicated to on-site managers in order to prevent similar mistakes on projects under construction. The public lacks readily available information about the nature and locations of DOE sponsored solar demonstration projects. Such simple measures as providing signs directing public attention to DOE - sponsored solar demonstration projects would help to improve this situation. Comments provided by the Assistant Secretary for Conservation and Solar Energy are appended.

31869 **(LA—9071-MS) Passive solar retrofit study for the United States Navy.** Wray, W.O.; Miles, C.R.; Kosiewicz, C.E. (Los Alamos National Lab., NM (USA)). Nov 1981. Contract W-7405-ENG-36. 27p. NTIS, PC A03/MF A01. Order Number DE82010975.

A passive solar retrofit study has been conducted for the United States Navy at the Los Alamos National Laboratory. The purpose of the study was to determine the energy savings obtainable in concrete block buildings from several passive solar heating and conservation strategies. A procedure involving the use of test cell data and computer simulation was employed to assess the merits of six retrofit options. The six strategies selected were chosen on the basis of providing a series of options that will deliver increasing energy savings at the cost of correspondingly increased levels of commitment.

31870 **(NP—2900958) Solar energy-utilization from the consumers' point of view. Report on a project to determine innovation trends and barriers.** Klein, H.J. 1979. 58p. (In German). NTIS (US Sales Only), PC A04/MF A01. Order Number DE82900958.

In the winter of 1978/1979, at the Sociological Institute of the University of Karlsruhe, FRG, a project seminar was held about innovative inclinations and barriers in the direct utilization of solar energy by private households. This report summarizes the results of the project. Topics of discussion were: geophysical, technical, and economical fundamentals of solar techniques, structures of the offers, market analyses, tendencies of the development, efficiency of collector systems, governmental support measures for solar techniques, legal aspects of buildings, and chances and limits of utilization of solar energy.

31871 **(PB—81-971025) Multiplexed logic controls solar-heating system: inexpensive sensors and logic circuits select from four operating modes. NTIS Tech Note.** (National Aeronautics and Space Administration, Washington, DC (USA)). Oct 1981. 1p. For information about subscribing to Tech Notes, please write NTIS Subscription Dept.

This citation summarizes a one-page announcement of technology available for utilization. A controller for solar heating uses inexpensive thermocouples as temperature sensors and uses simple logic circuits to select among four operating modes. The sensor signals are multiplexed through the same amplifier, instead of each being processed by separate amplifiers. Errors caused by differing amplifier characteristics are therefore avoided. Control is based on temperature differences (rather than on absolute temperatures). The controller was built for a solar heater in which air is the heat-transfer medium. For additional information, contact: The Patent Counsel, Marshall Space Flight Center, Alabama, refer to MFS-25287.

31872 **(SERI—0637-4) Proceedings of solar high-temperature industrial processes workshop.** (Solar Thermal Test Facilities Users Association, Albuquerque, NM (USA)). 1978. Contract AC02-77CH00178. 475p. (CONF-780956—). NTIS, PC A20/MF A01. Order Number DE82000718.

From Solar high-temperature industrial processes workshop; Atlanta, GA, USA (26 Sep 1978).

Separate abstracts were prepared for 34 papers in these proceedings. Also included are 3 papers previously abstracted for EDB, 2 welcoming addresses, 2 panel discussions, brief descriptions of topics that were planned but not presented, and a summary of the conference. (LEW)

31873 **(SERI/TR—663-1032) Decision criteria of potential solar IPH adopters.** Perwin, E.; Levine, A.; Mikasa, G.; Noun, R.; Schaller, D. (Solar Energy Research Inst., Golden, CO (USA)). Dec 1981. Contract AC02-77CH00178. 58p. NTIS, PC A04/MF A01. Order Number DE82007002.

If national programs are to be effective in the research and development of viable renewable resource technologies for the industrial sector, understanding industry's decision criteria will be important. The results of a preliminary investigation of the decision criteria of potential and actual users of solar industrial process heat systems are presented. Detailed interviews were completed with decision-makers from ten manufacturing firms. Based on economic theory, it was assumed that corporate decision-makers assess the expected cost, revenue, and uncertainty of competing investment opportunities. These decision criteria are composed of factors that are financial, technical, and institutional. Clearly, the firms interviewed were more concerned with costs than any other category of decision criteria. Most of the firms also believed that there was less uncertainty with competing investments than with current solar technology. Based on this preliminary investigation, a more extensive survey of industrial firms is suggested to determine a more comprehensive list of significant decision criteria.

31874 **(SOLAR/0909—81/70) Corrosion and scaling in solar heating systems.** Foresti, R.J. Jr. (Automation Industries, Inc., Silver Spring, MD (USA). Vitro Labs. Div.). Dec 1981. Contract AC01-79CS30027. 38p. NTIS, PC A03/MF A01. Order Number DE82006139.

Corrosion, as experienced in solar heating systems, is described in simplistic terms to familiarize designers and installers with potential problems and their solutions. The role of a heat transfer fluid in a solar system is briefly discussed, and the choice of an aqueous solution is justified. The complexities of the multiple chemical and physical reactions are discussed in order that uncertainties of corrosion behavior can be anticipated. Some basic theories of corrosion are described, aggressive environments for some common metals are identified, and the role of corrosion inhibitors is delineated. The similarities of thermal and material charactristics of a solar system and an automotive cooling system are discussed. Based on the many years of experience with corrosion in automotive systems, it is recommended that similar antifreezes and corrosion inhibitors should be used in solar systems. The importance of good solar system design and fabrication is stressed and specific characteristics that affect corrosion are identified.

31875 **(SSEC/SP—41227, pp 13p, Appendix III) Methodology for ranking cities for a solar buildings program.** Boyd, D.M. Jun 1981. NTIS, PC A04/MF A01.

In Houston, Texas design/build house. Case study report.

A procedure currently being used at the Southern Solar Energy Center (SSEC) to choose specific geographic locations toward which the early phases of a solar buildings program should be directed is discussed. The methodology is an example of multiattribute decision analysis. Using this methodology candidate locations are evaluated against a key set of independent selection criteria which have been determined to be important to the long range development of a market for passive solar buildings. Values for each selection criterion are combined to produce a composite score for each locality. By concentrating on those locations that are ranked high in the scoring, the program director and others charged with assisting program development are assured that the program is structured along appropriate lines. A record is established to indicate how the program was designed.

1410 Solar Collectors And Concentrators

REFER ALSO TO CITATION(S) 31986

31876 **(DOE/AL/16223—1) Engineering development studies for integrated evacuated CPC arrays. Interim technical progress report.** Winston, R. (Chicago Univ., IL (USA). Enrico Fermi Inst.). 30 Sep 1981. Contract AC04-81AL16223. 27p. NTIS, PC A03/MF A01. Order Number DE82005676.

A substantial improvement in optical efficiency over contemporary external reflector evacuated tube collectors has been achieved by integrating the reflector surface into the outer glass envelope. The design, fabrication and preliminary test results are described for a prototype collector based on this concept. Efficiencies above 40% up to nearly 300°C may be achieved. A comprehensive test program to measure performance and operational characteristics of a 2 m^2 panel (45 tubes) is being carried out and problems associated with the deployment and application of larger arrays are being studied.

31877 **(DOE/ER/04996—2) Development of materials for a luminescent solar collector. Annual progress report, Septemer 1, 1979-December 31, 1980.** Lempicki, A.; Andrews, L.; McCollum, B.C. (GTE Labs., Inc., Waltham, MA (USA)). 1981. Contract AC02-78ER04996. 29p. NTIS, PC A03/MF A01. Order Number DE82007518.

Progress is reported in research of inorganic fluorescent materials for application as flat panel luminescent solar collectors. Efforts were concentrated on luminescent metal ions doped into glasses. The spectroscopic and photophysical properties of Cr^{3+} in glasses were examined. Sensitization of Nd^{3+} by codoping with Cr^{3+} is discussed. The Cr^{3+} to Nd^{3+} energy transfer was characterized in lithium lime silicate and aluminum phosphate glasses as a function of active ion densities. (LEW)

31878 **(DOE/ER/10575—2) Fundamentals and techniques of nonimaging optics for solar-energy concentration. Annual progress and status summary.** Winston, R.; O'Gallagher, J. (Chicago Univ., IL (USA)). 30 Oct 1981. Contract AC02-80ER10575. 17p. NTIS, PC A02/MF A01. Order Number DE82004885.

This is the first year in a formal three year program whose basic objectives are the further development of the theoretical formulation of nonimaging optical principles and the investigation of practical questions having to do with the implementation of newly developed designs for solar and other applications. During this year the theoretical formalism established during earlier programs was extended so that one can now describe all forms of ideal concentrators known at present as shapes which do not disturb the lines of flow of a vector field defining the so called vector flux J. A search for a differential equation (other than div J = 0) has so far been unsuccessful in the geometrical optics framework. However, an extension to the physical optics domain based on new theories of radiometry in partially coherent light has been initiated and appears more promising. Linear concentrator designs to reduce gap losses for tubular absorbers have been analyzed in detail. Studies of the performance of Fresnel lenses and less conventional diffractive components (i.e. holograms) have been initiated. A ray trace optimization of two second stage concentrators (the CEC and the trumpet) has been carried out. Experimental measurements and ray trace studies of the response of an actual concentrator shape and absorber configuration for a fabricated prototype shows that deviation from ideal behavior can be accurately modeled. Preliminary instrumentation calibrations necessary to carry out a planned survey of the distribution of diffuse sunlight has been started. Satisfactory progress has been made in each of the planned research areas and no changes in directions or objectives are necessary.

31879 **(LA-UR—81-3610) Solar-absorber-selective paint research.** Moore, S.W. (Los Alamos National Lab., NM (USA)). 1982. Contract W-7405-ENG-36. 9p. (CONF-820107—3). NTIS, PC A02/MF A01. Order Number DE82006104.

From SPIE optical coatings for energy efficiency and solar applications conference; Los Angeles, CA, USA (25 Jan 1982).

Research and development on thickness-sensitive and thickness-insensitive solar paints are discussed. The thickness-sensitive paints include reverse roll coated, gravure printed, and spray coated paints. The coating methods and optical properties of the thickness-sensitive paints are discussed. The thickness-insensitive solar paints include a low emittance flake such as aluminium-flake, and pigment. Durability tests are discussed, including accelerated weathering and humidity durability tests, for the thickness-sensitive coatings. (LEW)

31880 **(PB—82-157553) Solar concentrators.** Almanza, R.; Valdes, A.; Lopez, S. (Universidad Nacional Autonoma de Mexico, Mexico City. Inst. de Ingenieria). Jun 1981. Translation of Concentradores Solares, Mexico City, 48p, Jun 81. 40p. NTIS, PC A03/MF A01.

A very important subject in some solar energy applications is the development of solar concentrators since these devices make it possible to obtain temperatures in the range of 100 to 3,600 degrees C. This paper presents different types of geometries used in concentrators. Some comments are made on the theoretical and experimental analysis necessary to evaluate the geometries and on the type of laboratory equipment needed to obtain experimental data. At the end of the report, a description of how to build parabolic trough mirrors is made. The experience gained by the authors, who have been working on this subject for the past five years, is summarized, showing some of the problems related with such concentrators.

15 GEOTHERMAL ENERGY

1501 Resource Status And Assessment

31881 **(DOE/RA/50076—T12) Geothermal Development Plan: Pima County.** White, D.H. (Arizona Solar Energy Commission, Phoenix (USA); Arizona Univ., Tucson (USA). Dept. of Chemical Engineering). 1981. Contract FC03-80RA50076. 51p. NTIS, PC A04/MF A01. Order Number DE82006759.

Pima County is located entirely within the Basin and Range physiographic province in which geothermal resources are known to occur. Continued growth as indicated by such factors as population growth, employment and income will require large amounts of energy. It is believed that geothermal energy could provide some of the energy that will be needed. Potential users of geothermal energy within the county are identified.

1502 Geology And Hydrology Of Geothermal Systems

31882 **(UCRL—15423) Elastomechanical methods in the exploration of the Valles Caldera, New Mexico. Final report, June 8, 1981-October 8, 1981.** Bodvarsson, G. (Lawrence Livermore National Lab., CA (USA); Oregon State Univ., Corvallis (USA). School of Oceanography). 1981. Contract W-7405-ENG-48. 129p. NTIS, PC A07/MF A01. Order Number DE82006923.

The Valles caldera in the Jemez Mountains of New Mexico is a case of an active caldera that is an object for a comprehensive ground tilt field program to map both elastic and rheic discontinuities. Based on a rather comprehensive theoretical development that is outlined in five separate Essays, estimates of the amplitudes of some of the possible ground tilt signals were obtained. Based on the results, the strongest signals of the order of 100 to 200 nanoradians would appear to result from the purely elastic response of the caldera fill to a barometric forcing. Moreover, assuming a magmatic underplate below the Valles, barometric forcing may lead to a flexure of the upper crust that could generate tilt signals of a similar magnitude. Present data material is insufficient to allow a useful estimate to be made of the possible tilt signals due to the rheic properties of a Valles pluton that may be in the state of partial fusion.

1503 Geothermal Exploration And Exploration Technology

REFER ALSO TO CITATION(S) 32456, 32467, 32468

31883 (SAND—82-0425, pp 17-20) **Gallium phosphide devices.** Eknoyan, O.; van der Hoeven, W.B.; Weichold, M.H. (Texas A and M Univ., College Station). Feb 1982. NTIS, PC A09/MF A01.

From IEEE high temperature electronics and instrumentation conference; Houston, TX, USA (7 Dec 1981).

The results are summarized of efforts made on the formation of reliable ohmic contacts to both n-type and p-type GaP, formation of Schottky diodes, and the fabrication and demonstration of transistor action by means of GaP MESFET devices. (LEW)

31884 (SAND—82-0425, pp 51-56) **High temperature magnetometer feasibility study.** Kerwin, W.J.; Hamilton, D.J.; Raymond, L.S.; Schoeneman, D.W. (Univ. of Arizona, Tucson). Feb 1982. NTIS, PC A09/MF A01.

From IEEE high temperature electronics and instrumentation conference; Houston, TX, USA (7 Dec 1981).

The following magnetometers are discussed for measuring magnitude and direction of the Earth's magnetic field within a geothermal borehole: flux-gate, electron beam, Hall effect, and rotating coil. Experimental tests on the flux-gate and electron beam magnetometers are described. The electron beam magnetometer using integrated thermionic circuit technology was selected for further development. (MHR)

31885 (SAND—82-0425, pp 59-64) **Commercial 200-275°C hybrids.** Gopal, S. (Teledyne Philbrick, Dedham, MA). Feb 1982. NTIS, PC A09/MF A01.

From IEEE high temperature electronics and instrumentation conference; Houston, TX, USA (7 Dec 1981).

The design and development of high temperature hybrids and some of the problems encountered in producing electrically and mechanically reliable hybrids at 275°C are outlined. Initial mechanical and electrical failures have led to the development of better fabricating techniques and better methods of pre-testing and characterizing active components. Hybrid components for geothermal logging instrumentation were the first 275°C hybrids that were developed commercially.

31886 (SAND—82-0425, pp 125-136) **Materials and interfaces for high temperature MOS and CMOS components.** McBrayer, J.D. (Sandia National Labs., Albuquerque, NM); Draper, B.L.; Swanson, D. Feb 1982. NTIS, PC A09/MF A01.

From IEEE high temperature electronics and instrumentation conference; Houston, TX, USA (7 Dec 1981).

Results of initial aging tests on high temperature CMOS components are presented. Auger profiling of aged and unaged MOS capacitors are presented along with a discussion of possible deleterious effects of high temperature operation. It is found that the Al/SiO_2 interface is not a major failure mode in Al metallized semiconductors used in high temperature environments. Aluminium reacts with SiO_2 to form an $Al\text{-}Al_2O_3\text{-}SiO_2\text{-}Si$ layered structure which is found to be stable for at least 600 hours at 400°C. Dry O_2 oxides are found to be more stable than steam grown oxides. The degradation of dielectrically isolated NAND gates is found not to be caused by problems at the Al/SiO_2 interface. It is believed that threshold instabilities caused by surface state growth, charge trapping in the gate oxide, or mobile charge in the oxide may be the cause of eventual device failure. (LEW)

31887 (SAND—82-0425, pp 137-146) **Amorphous metal diffusion barriers.** Guo, K.J.; Wiley, J.D.; Perepezko, J.H.; Nordman, J.E.; Aaron, D.B.; Dobisz, E.A.; Madisen, D.E.; Thomas, R.E. (Univ. of Wisconsin, Madison). Feb 1982. NTIS, PC A09/MF A01.

From IEEE high temperature electronics and instrumentation conference; Houston, TX, USA (7 Dec 1981).

Experimental evidence is presented of the effectiveness of amorphous metal films as diffusion barriers between Au or Cu overlayers and Si, GaAs, or GaP substrates. Although amorphous metal films are not found to be universal diffusion barriers, they are found to perform substantially better than conventional polycrystalline barriers and to offer great promise in high-temperature applications. (LEW)

31888 (SAND—82-0425, pp 165-174) **Development of a metal sheath cable.** Halpenny, A.S. (Halpen Engineering, Inc., Buffalo, NY); Gray, S.J. Feb 1982. NTIS, PC A09/MF A01.

From IEEE high temperature electronics and instrumentation conference; Houston, TX, USA (7 Dec 1981).

The special problems of a geothermal logging cable have been resolved by special splicing techniques and by reinforcing the core cable with multiple sheaths. Several thousand feet of geothermal logging cable have been produced. (MHR)

31889 (SAND—82-0425, pp 175-176) **High pressure-high temperature borehole fluid sampler.** Hansen, L.J. (Lawrence Berkeley Lab., CA). Feb 1982. NTIS, PC A09/MF A01.

From IEEE high temperature electronics and instrumentation conference; Houston, TX, USA (7 Dec 1981).

The design, fabrication, and testing of a fluid sampler for use in geopressured wells are described briefly. The specifications of the resulting sampler are listed. (MHR)

31890 (SAND—82-0425, pp 177-184) **High-temperature acoustic borehole televiewer.** Heard, F.E.; Bauman, T.J. (Sandia National Labs., Albuquerque, NM). Feb 1982. NTIS, PC A09/MF A01.

From IEEE high temperature electronics and instrumentation conference; Houston, TX, USA (7 Dec 1981).

The acoustic borehole televiewer has been shown to be the most useful tool for determining location, orientation, and characterization of fractures as they intersect the borehole. However, it has not been capable of operation at geothermal temperatures. An effort conducted at Sandia National Laboratories to develop a televiewer for operation in a geothermal environment is described. Theory of operation, design methods, and test results are discussed. The Sandia televiewer has operated successfully at a temperature of 275°C and pressure of 4500 psi.

31891 **Chemical logging of geothermal wells.** Allen, C.A.; McAtee, R.E. (to Dept. of Energy). US Patent 4,306,879. 22 Dec 1981. Filed date 19 Dec 1979. vp.

PAT-APPL-105337.

The presence of geothermal aquifers can be detected while drilling in geothermal formations by maintaining a chemical log of the ratio of the concentrations of calcium to carbonate and bicarbonate ions in the return drilling fluid. A continuous increase in the ratio of the concentrations of calcium to carbonate and bicarbonate ions is indicative of the existence of a warm or hot geothermal aquifer at some increased depth.

1506 Environmental Aspects And Waste Disposal

REFER ALSO TO CITATION(S) 31895

31892 **(NP—2902054) Drilling and operating oil, gas, and geothermal wells in an H_2S environment.** Dosch, M.W.; Hodgson, S.F. (California Div. of Oil and Gas, Sacramento (USA)). 1981. 45p. (M—10). California Division of Oil & Gas, Dept. of Cons., 1416 9th St., Room 1310, Sacramento, CA 95814.

Portions of document are illegible.

The following subjects are covered: facts about hydrogen sulfides; drilling and operating oil, gas, and geothermal wells; detection devices and protective equipment; hazard levels and safety procedures; first aid; and H_2S in California oil, gas, and geothermal fields. (MHR)

1508 Geothermal Power Plants

31893 **(CONF-810812—42) Analyses of mixed hydrocarbon binary thermodynamic cycles for moderate temperature geothermal resources.** Demuth, O.J. (EG and G Idaho, Inc., Idaho Falls (USA)). 1981. Contract AC07-76ID01570. 6p. NTIS, PC A02/MF A01. Order Number DE82006272.

From IECEC conference; Atlanta, GA, USA (9 Aug 1981).

A number of binary geothermal cycles utilizing mixed hydrocarbon working fluids were analyzed with the overall objective of finding a working fluid which can produce low-cost electrical energy using a moderately low temperature geothermal resource. Both boiling and supercritical shell-and-tube cycles were considered. The performance of a dual-boiling isobutane cycle supplied by a 280°F hydrothermal resource (corresponding to the 5MW pilot plant at the Raft River site in Idaho) was selected as a reference. To investigate the effect of resource temperature on the choice of working fluid, several analyses were conducted for a 360°F hydrothermal resource, which is representative of the Heber resource in California. The hydrocarbon working fluids analyzed included methane, ethane, propane, isobutane, isopentane, hexane, heptane, and mixtures of those pure hydrocarbons. For comparison, two fluorocarbon refrigerants were also analyzed. Preliminary estimates of relative heat exchanger size (product of overall heat transfer coefficient times heater surface area) were made for a number of the better performing cycles. For the 280°F resource, a mixture of 90% propane and 10% isopentane in a supercritical cycle showed the highest value of net geofluid effectiveness of the working fluids assessed. The more promising of the cycles employing mixed hydrocarbon working fluids require heaters which are estimated to range from seven to approximately 50% larger in total surface area than those for the reference cycles.

1509 Geothermal Engineering

31894 (SAND—82-0425, pp 149-158) **High temperature Y267 EPDM elastomer field and laboratory experiences, August 1981.** Hirasuna, A.R.; Friese, G.J.; Stephens, C.A. (L'Garde, Inc., Newport Beach, CA). Feb 1982. NTIS, PC A09/MF A01.

From IEEE high temperature electronics and instrumentation conference; Houston, TX, USA (7 Dec 1981).

Downhole and laboratory trials of L'Garde's Y267 EPDM were successful. Those 14 experiences indicate that Y267 EPDM is the superior elastomer for high temperature aqueous environments. Test data is also building which indicates superiority for high temperature hydrocarbon oil environments for static seals, isobutane and hydrazine environments.

1520 Geothermal Data And Theory

REFER ALSO TO CITATION(S) 32195, 32244

31895 (DOE/SF/10838—T1) **Identification of solid wastes in geothermal operations. Acurex draft final report 80-70/EE.** (Acurex Corp., Mountain View, CA (USA). Energy and Environmental Div.). Sep 1980. Contract AI03-80SF10838. 128p. NTIS, PC A07/MF A01. Order Number DE82002252.

An overview of the project and its results is presented. The field sampling program is described and the analytical methods and results are presented. The analytical results are discussed. (MHR)

31896 (UCID—19291) **Solvent extraction of methane from simulated geopressured-geothermal fluids: sub-pilot test results.** Quong, R.; Otsuki, H.H.; Locke, F.E. (Lawrence Livermore National Lab., CA (USA)). 14 Jan 1982. Contract W-7405-ENG-48. 28p. NTIS, PC A03/MF A01. Order Number DE82010992.

The extraction of methane dissolved in 15 wt % sodium chloride solution at 150°C and 1000 psi has been demonstrated using n-hexadecane as the solvent in a sub-pilot scale extraction column operated in a continuous, countercurrent flow mode. Greater than 90% recovery of methane was obtained with solvent/brine mass flow ratios in the range of .040 to .045. The height of an ideal stage in this experimental Elgin-type spray column is estimated to be 1.5 ft. Application of this process on actual geopressured fluids is technically feasible, and when combined with direct drive injection disposal is economically attractive. Design and operation of a methane saturated-brine supply system to provide simulated geopressured fluid continuously at 150°C and 1000 psi are also described.

17 WIND ENERGY

1701 Availability (climatology)

REFER ALSO TO CITATION(S) 32475

31897 (SSEC/TP—31262, pp 76p, Report A) **Virgin Islands wind energy siting analysis. Final report.** Vukovich, F.M.; King, W.J.; Abbott, D.H. (Research Triangle Inst., Research Triangle Park, NC). Sep 1981. NTIS, PC A06/MF A01.

In Wind energy feasibility assessment for the US Virgin Islands.

A preliminary assessment of the wind energy potential in the US Virgin Islands is presented. Based upon the results of this assessment and a study of the topography of the islands, potential sites for wind energy conversion systems (WECS) are identified on St. Croix, St. Thomas, and St. John. Historical wind data from the islands is sparse and the analysis techniques used in this study are relatively unsophisticated. Therefore, the identification of potential WECS sites must be considered extremely preliminary. A detailed study is recommended involving atmospheric modeling and field measurement programs to verify which locations are best suited for the installation of WECS units to alleviate peak electrical load problems in the islands.

1705 Environmental Aspects

REFER ALSO TO CITATION(S) 31899

1706 Wind Energy Engineering

31898 (DOE/NASA/20320—34) **Variable gain for a wind turbine pitch control.** Seidel, R.C.; Birchenough, A.G. (National Aeronautics and Space Administration, Cleveland, OH (USA). Lewis Research Center). Dec 1981. Contract AI01-76ET20320. 12p. (NASA-TM—82751). NTIS, PC A02/MF A01. Order Number DE82007020.

A variable gain is considered for a wind turbine pitch angle control. The gain variation is made in the software logic of the pitch angle controller. The controller gain is structured to be proportional and integral feedback of power. The gain level is changed depending upon the level of power error. The control uses low gain for low pitch activity the majority of the time. If the power exceeds ten percent offset above rated, the gain is increased to a higher gain to more effectively limit power. A variable gain control functioned well in tests on the Mod-0 wind turbine.

31899 (DOE/R5/10301—1) **Development of slide program describing site-selection process for Small Wind Energy Conversion Systems (SWECS).** Otawa, T. (Ball State Univ., Muncie, IN (USA). Wind Energy Research Team). Dec 1981. Contract FG02-81R510301. 13p. NTIS, PC A02/MF A01. Order Number DE82006209.

This semi-annual report summarizes the work performed during the first half of the project period, October 1 through December 31, 1981. The major objective of this study is to promote better site-selection methods for small wind energy conversion systems (SWECS). To achieve this objective, a slide program will be produced, and it will introduce the general site-selection methods, incorporating the major issues that affect the decision-making process involved in SWECS siting. These major issues have been identified in this report as part of the effort to fully examine the state-of-the-art in SWECS siting.

31900 (Riso-M—2153) **Basic theoretical calculations of wind turbines.** Andersen, P.S.; Lundsager, P.; Petersen, H.; Krabbe, U. (Research Establishment Risoe, Roskilde (Denmark)). Jan 1980. 146p. (In Danish). NTIS (US Sales Only), PC A07/MF A01. Order Number DE82900609.

This report treats elements of basic turbine theory. The subjects are: (a) Aerodynamics of the horizontal shaft rotor including computation of loads and expected power production. (b) Structural static and dynamic analysis of the rotor blades. (c) The use of asynchronous machines as generators for wind mills and various possibilities for control of the generator. The theoretical treatment is everywhere illustrated with examples to facilitate application of theory. All computer codes described in the report are available at Risoe National Laboratory for consulting services.

20 ELECTRIC POWER ENGINEERING

2001 Power Plants And Power Generation

REFER ALSO TO CITATION(S) 31743, 31843, 31986, 32085, 32102

31901 (NP—2901105) **Contribution to the investigation of the STROUHAL number of high structures in natural wind for very high Reynolds numbers.** Wenderoth, O. (Karlsruhe Univ. (TH) (Germany, F.R.). Fakultaet fuer Maschinenbau). 14 Dec 1979. 92p. (In German). NTIS (US Sales Only), PC A05/MF A01. Order Number DE82901105.

Thesis.

For high, towerlike structures like industrial stacks, masts or radio-towers horizontal wind forces mostly are the dominant loads.

Therefore the periodic shedding of vortices for transcritical Re numbers (Re approx. $> 6 \times 10^6$) is studied at high towerlike structures with circular cross-section. For this purpose measurements were made at different heights at the radio tower Aufhausen and satellite pictures with atmospheric Karman vortices were evaluated. The Strouhal number was determined at constant wind velocity and diction for $Re > 6 \times 10^6$. From the unsteady pressure distributions the associated drag coefficients csub(w) and lateral drift coefficients csub(s) are derived.

31902 **(ORNL/SUB—7435/1) Guide for prioritizing power plant productivity improvement projects: modification and simplification of the DOE/MRI methodology.** (Trident Engineering Associates, Inc., Annapolis, MD (USA); Oak Ridge National Lab., TN (USA)). Mar 1981. Contract W-7405-ENG-26. 33p. NTIS, PC A03/MF A01. Order Number DE82007115.

In recent years, the subject of public utility power plant productivity and reliability has received significant attention from both federal and state agencies and from within the utilities. One study was a FEA-sponsored program that had as its purpose the development of improved techniques for assessing cause of power plant unavailability. The results of this study have become widely known as the DOE/MRI methodology for calculating increased power plant equivalent availability resulting from instituting improvement projects. To further the development of the DOE/MRI methodology for assessing and quantifying the effect of improvement projects, the DOE initiated studies with two states to demonstrate the methodology in operating plants. These studies were focused on applying the methodology to specific power plants (fossil-fueled and nuclear) and on identifying any difficulties in using the method. In the course of these investigations, several problems were uncovered. Various recommendations were made for both eliminating the identified deficiencies in the methodology and for simplifying several of the calculations needed to evaluate proposed plant improvements. The information provided here describes four major modifications to the DOE/MRI methodology which eliminate previously uncovered deficiencies and simplify calculational methods.

31903 **(ORNL/Sub—7435/2) Guide for prioritizing power plant productivity improvement projects: handbook of availability improvement methodology.** (Trident Engineering Associates, Inc., Annapolis, MD (USA); Oak Ridge National Lab., TN (USA)). 15 Sep 1981. Contract W-7405-ENG-26. 195p. NTIS, PC A09/MF A01. Order Number DE82006938.

As part of its program to help improve electrical power plant productivity, the Department of Energy (DOE) has developed a methodology for evaluating productivity improvement projects. This handbook presents a simplified version of this methodology called the Availability Improvement Methodology (AIM), which provides a systematic approach for prioritizing plant improvement projects. Also included in this handbook is a description of data taking requirements necessary to support the AIM methodology, benefit/cost analysis, and root cause analysis for tracing persistent power plant problems. In applying the AIM methodology, utility engineers should be mindful that replacement power costs are frequently greater for forced outages than for planned outages. Equivalent availability includes both. A cost-effective ranking of alternative plant improvement projects must discern between those projects which will reduce forced outages and those which might reduce planned outages. As is the case with any analytical procedure, engineering judgement must be exercised with respect to results of purely mathematical calculations.

31904 **(SV-FUD—4-2) Multi state simulation model of the maintenance for a power generating station.** Karlsson, B.O. (Statens Vattenfallsverk, Stockholm (Sweden)). Sep 1980. 66p. NTIS (US Sales Only), PC A04/MF A01. Order Number DE81701005.

A multistate simulation model for a thermal power generating station is described. The performance is modelled as a function of the system structure, the component reliability, the number of repair crews, the repair times and the availability of spare parts. Each component can be in either of four states: failed, working, postponed, or standby. A component will be in the postponed state, if due to failures in other components it is turned off. Two different types of failures are assumed: minor and severe. Evaluation of the system state is performed by repeated use of four elementary system functions: series, parallel, k-out-of-n, and standby k/l/n. Numerical results for a case study are presented.

31905 **Critical heat flux in the channels of a closed-loop water-cooled turbine.** Motakef, S.; El-Masri, M.A.; Louis, J.F. (MIT, Cambridge, Mass). *American Society of Mechanical Engineers, [Paper];* No. 81-HT-74, vp(Aug 1981).

Critical Heat Flux (CHF) is a primary consideration in the design of closed-loop water cooled turbines. The large centrifugal and Coriolis forces introduce buoyancy effects that can dominate forced convection flow. Their result is to introduce substantial deviations in CHF levels from what can be calculated for stationary tubes from known correlations. In this paper recent experimental results encompassing a wide range of rotational speeds, tube diameters, and local pressures, including supercritical, are reported. Although an accurate correlation covering the wide range of parameters was not possible, the data confirm the previous mechanistic model. 17 refs.

31906 **Mechanical, thermal and hydraulic design of a monometallic water-cooled gas turbine nozzle.** Geiling, D.W.; DeGeorge, C.L. (GE, Schenectady, NY). *American Society of Mechanical Engineers, [Paper];* No. 81-HT-77, vp(Aug 1981).

Critical technology development and component verification testing of an advanced water-cooled gas turbine, firing at 2600 F (1427 C) are being performed under Phase II of the Department of Energy funded High Temperature Turbine Technology Program. This paper describes the design of the monometallic Inconel 718 water-cooled second stage nozzle. Mechanical, thermal, and hydraulic considerations are discussed. The results of detailed finite element thermal, structural, and hydraulic analyses are presented as well as test results of a scale hydraulic model of the cooling circuit. Results of prototype testing at 2082 F (1139 C) are discussed as they relate to verification of the design. 15 refs.

31907 **Corrosion-erosion test rig for high temperature turbine materials evaluation.** Mogul, J.; Wolosin, S.; Eckstein, A. (Curtiss-Wright Corp, Wood-Ridge, NJ). *American Society of Mechanical Engineers, [Paper];* No. 81-GT-198, vp(Mar 1981).

A coal-derived combined-cycle power conversion system requires a gas turbine which can operate at temperatures over 2600 F (1427 C) on synthetic fuels containing both erosive and corrosive species which can deal with high gas temperature and the aggressive atmosphere is transpiration-air-cooling (TAC). TAC turbine vanes and blades utilize a porous metal airfoil through which a protective barrier of cooling air diffuses. The corrosion-erosion rig evaluated Nichrome V-Cb, FeCrAlY, Hoskins 875, and Hastelloy S. 6 refs.

31908 **Limiting factors in the calculation of depletion under creep stress conditions.** Huebner, F.W. *VGB Kraftwerkstechnik;* **61**: No. 3, 246-253(Mar 1981). (In German).

All limiting factors, which are described in detail in this paper, on the calculation of depletion of components subjected to creep stress, can be attributed to variations in operating temperature and operating stresses compared with design values formulated as constants. The variations in plant life resulting from deviations can be estimated by using correction factors represented by way of examples for certain materials.

31909 **Rehabilitation of a coal conveyor system at Frimmersdorf power station following a fire.** Eue, H.J. *VGB Kraftwerkstechnik;* **61**: No. 3, 257-264(Mar 1981). (In German).

During a major fire, severe damage was caused to a 90 m long steel latticed girder conveyor and this led to the shutdown of a 90 MW power plant. Acute danger of collapse existed. Such a collapse would have affected large sections of the adjacent boiler houses. The most urgent problem was, therefore, to secure the con-

veyor from collapsing. In considering the various options available, the local cramped conditions led to the decision to install direct supports at the height of 40 m. The execution of the work was a race against time.

31910 Reliability studies in a power plant system. Fengler, G.; Hanitsch, R.; Roske, H.; Voigt, B. pp 171-177 of Technische Zuverlaessigkeit. Ihre Verwirklichung unter den Bedingungen der Zukunft. Duesseldorf, Germany, F.R.; VDI-Verlag (1981). (In German)

From 11. meeting - how to achieve technical reliability under conditions relating to the future; Nuernberg, Germany, F.R. (13 - 15 May 1981).

Over a period of 7 years, reliability characteristics for electricity supply have been determined for a public utility during the daily peak load periods. It was found that the common method of risk assessment during peak load periods should be supplemented by a consideration of supply shortage probabilities over other periods of the year.

2002 Environmental Aspects

REFER ALSO TO CITATION(S) 31743, 32478, 32526, 32589

31911 (NP—2902471) Environmental, legal and political constraints on power plant siting in the southwestern United States. Special Series 16. Hamilton, M.S.; Wengert, N. (Colorado State Univ., Fort Collins (USA)). Dec 1980. 183p. Colorado State University, Office of University Comm., Fort Collins, CO 80523 $3.25.

Portions of document are illegible.

Local land use controls rank with environmental assessment requirements, public service commission certification, and state siting permits as important milestones during selection and approval of sites for new coal-fired and nuclear electric generating stations. Local permitting proceedings may play a determinative role in whether a facility is actually constructed as proposed. Causes of construction delays are briefly surveyed in the context of planning lead times reported by electric utility managers. Responsibilities of federal land managers under current air quality, endangered species, wilderness designation, and organic land management legislation are reviewed. Potential opportunities and difficulties with development of energy facilities on Native American Indian lands are discussed, with consideration of possible institutional improvements. Socioeconomic impacts of rapid population growth, and competition for water between municipal, industrial, and agricultural users in the semi-arid Southwest are treated in their political context. Information concerning the number and nature of permits required for 24 bulk electric power generating projects proposed or constructed since 1970 in six Southwestern states (Arizona, California, Colorado, Nevada, New Mexico and Utah) are displayed in tabular form. Narrative case histories of recent siting experience with the Intermountain Power Project, New Mexico Generating Station, San Joaquin Nuclear Project, Subdesert Nuclear Project, and Rawhide Energy Project are provided. Extensive references.

2003 Power Transmission And Distribution

REFER ALSO TO CITATION(S) 32085, 32086

31912 (NP—2901106) Calculation of the load from short circuit currents in high-voltage systems with non-bunched conductor cables. Engel, B. (Erlangen-Nuernberg Univ., Erlangen (Germany, F.R.). Technische Fakultaet). 12 Nov 1979. 140p. (In German). NTIS (US Sales Only), PC A07/MF A01. Order Number DE82901106.

Thesis.

Until now for determination of the load caused by short circuit currents in conductor cables of switchboard plants one was exclusively dependent on experiments and approximate methods. In this paper a numerical method based on the method of finite elements is developed and checked by application to test examples. By this method also complicated configurations to which the approximate methods are not applicable can be calculated. Parameters of influence not known up to make themselves felt; their numerical values are derived from experiments. For further investigation of these parameters and their being necessarily taken into account proposals are made.

31913 Role of the density function of outage energy in the reliability analysis of electric power supply grids. Peters, H. pp 167-170 of Technische Zuverlaessigkeit. Ihre Verwirklichung unter den Bedingungen der Zukunft. Duesseldorf, Germany, F.R.; VDI-Verlag (1981). (In German)

From 11. meeting - how to achieve technical reliability under conditions relating to the future; Nuernberg, Germany, F.R. (13 - 15 May 1981).

Outages are very infrequent in overlapping, but energy losses, i.e. energy not supplied, are rather high and unevenly distributed. The expectation value (= incidence x mean loss) is rather inaccurate and may even be misleading. For this reason the author proposes that network reliability should not be judged on the basis of the expectation value of the outage energy but on the basis of their density or distribution functions. From these, the failure probability and distribution can be determined. Also, it is well-known that large losses are subjectively considered to be disproportionally important. These considerations can be used as a general basis for the evaluation of rare events.

21 NUCLEAR POWER PLANTS

REFER ALSO TO CITATION(S) 31967

31914 (FEI—1126) Determination of quantity performances of the parametric reliability for unique objects. Ostreikovskii, A.A.; Petrenko, A.A.; Sal'nikov, N.L. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Obninsk. Fiziko-Ehnergeticheskij Inst.). 1980. 12p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700367.

The methods of determining the probability of technological parameters (TP) (temperature, pressure, coolant consumption) yield of the nuclear power plant (NPP) beyond tolerance field bounds established by technical operation conditions are considered. Investigated are the cases of TP stationary character variation when the parametric reliability of the object is characterised by failures caused by TP fallout beyond tolerance limit and TP nonstationary character variation when parametric reliability of the object is characterized by TP gradual approximation to tolerance limit. For the problem solution the methods of Markov process theory are used. The conclusion is drawn that the described methods give the possibility to obtain quantitative estimation of interrelation of NPP TP tolerances and stochastic properties by operation data and can be used for creating the system of probability forecast of NPP efficiency.

31915 (FRNC-CONF—206) French electromechanical industry in the nuclear sector. de Barrau, M. (Alsthom, 75 - Paris (France)). Feb 1981. 6p. (In French). (CONF-810270—6). NTIS (US Sales Only) PC A02/MF A01. Order Number DE82780032.

From French-Greek colloquium on energy; Athens, Greece (26 Feb 1981).

A brief paper recounts the extensive changes brought about in electromechanics for the implementation of the large French nuclear programme and the experience that its implementation has given to this industry, in particular at ALSTHOM-ATLANTIQUE, the only French manufacturer of high power turbo-generating units rated among the big world manufacturers.

2101 Power Reactors, Non-breeding, Light-water Moderated, Boiling Water Cooled

REFER ALSO TO CITATION(S) 31958, 32016, 32017, 32019, 32020, 32021,

32022, 32023, 32024, 32025, 32026, 32027, 32028, 32030, 32031, 32032, 32043, 32044, 32047, 32055, 32058

31916 (NUREG/CR—2408) Curve fitting and uncertainty analysis of Charpy impact data. Stallmann, F.W. (Oak Ridge National Lab., TN (USA); Tennessee Univ., Knoxville (USA). Dept. of Mathematics). Jan 1982. Contract W-7405-ENG-26. 27p. (ORNL/TM—8081). NTIS, PC A03/MF A01. Order Number DE82005787.

A method for the statistical evaluation of Charpy impact data is described. A multi-variate linear least squares fit is used in which both dependent and independent variables may be subject to statistical variations. The input data are restricted to the transition region for the determination of RT/sub NDT/ and to the upper-shelf region for the determination of the upper-shelf energy. Fluence, irradiation temperature, chemical composition, and other parameters may be included in the fit in order to process simultaneously large data sets and to estimate the dependence of ΔRT/sub NDT/ and shift of upper-shelf energy on the parameters. Data from HSST experiments at ORNL are used to demonstrate the application of this method.

31917 (ORNL/SUB—7537/15) Boiling water reactor uranium utilization improvement potential. Wei, P.; Crowther, R.L.; Fennern, L.E.; Savoia, P.J.; Specker, S.R.; Tilley, R.M.; Townsend, D.B.; Wolters, R.A. (Oak Ridge National Lab., TN (USA); General Electric Co., San Jose, CA (USA). Nuclear Energy Div.). Jun 1980. Contract W-7405-ENG-26. 167p. NTIS, PC A08/MF A01. Order Number DE82007498.

This report documents the results of design and operational simulation studies to assess the potential for reduction of BWR uranium requirements. The impact of the improvements on separative work requirements and other fuel cycle requirements also were evaluated. The emphasis was on analysis of the improvement potential for once-through cycles, although plutonium recycle also was evaluated. The improvement potential was analyzed for several design alternatives including axial and radial natural uranium blankets, low-leakage refueling patterns, initial core enrichment distribution optimization, reinsert of initial core discharge fuel, preplanned end-of-cycle power coastdown and feedwater temperature reduction, increased discharge burnup, high enrichment discharge fuel rod reassembly and reinsert, lattice and fuel bundle design optimization, coolant density spectral shift with flow control, reduced burnable absorber residual, boric acid for cold shutdown, six-month subcycle refueling, and applications of a once-through thorium cycle design and plutonium recycle.

31918 (PNL-SA—9100) Assessment of nonbackfittable concepts for improving uranium utilization in LWRs. Newman, D.F.; Goldsmith, S.; Fleischman, R.M. (Pacific Northwest Lab., Richland, WA (USA)). 25 Nov 1980. Contract AC06-76RL01830. 6p. (CONF-810606—104). NTIS, PC A02/MF A01. Order Number DE82006079.

From American Nuclear Society's annual meeting; Miami Beach, FL, USA (7 Jun 1981).

Recent efforts to improve uranium utilization in light water reactors (LWRs) have involved backfittable changes to fuel or operations. The Advanced Reactor Design Study sponsored by the US Department of Energy identified and evaluated nonbackfittable LWR concepts to provide a basis for selecting and demonstrating specific improvements that have good implementation potential. Because the application of nonbackfittable concepts necessitates modifications to contemporary reactor designs, it was apparent that the most qualified organizations to assess implementation potential would be LWR designers/vendors. Accordingly, Babcock and Wilcox, Combustion Engineering, and General Electric were the principal participants in selecting, assessing, and evaluating the nonbackfittable concepts included in this study. The results of the industrial assessments of nonbackfittable LWR concepts are shown.

31919 Flow induced vibration in the design of nuclear components. Bohm, G.J.; Tagart, S.W. (Westinghouse Electr Corp, Pittsburgh, Pa). *HTD [Publication] (American Society of Mechanical Engineers);* **52**: 1-10(1981).

This paper discusses the basic phenomena observed in LWR systems and the history of the problems. Flow-induced vibration is at a state-of-art where detailed design procedures cannot be finalized in a standard code form for all types of components and flow conditions of interest. What has been done is to identify flow vibration mechanisms, quantitatively describe their effects on components and provide guidance to the designers. Present technology is based on information obtined on tests combined with analytical methods developed for a better understanding of the phenomena. 25 refs.

2102 Power Reactors, Non-breeding, Light-water Moderated, Non-boiling Water Cooled

REFER ALSO TO CITATION(S) 31916, 31918, 31919, 31956, 32014, 32016, 32017, 32029, 32032, 32039, 32050, 32051, 32054, 32056, 32057

31920 (INIS-mf—6753) Coastdown in light water reactors as a fuel management strategy. Lobo, L.G. (Massachusetts Inst. of Tech., Cambridge (USA). Dept. of Nuclear Engineering). Dec 1980. 216p. NTIS (US Sales Only), PC A10/MF A01. Order Number DE82780202.

Thesis.

Improved uranium utilization by means of extended burnup via routine end-of-cycle coastdown has been analyzed, with a specific focus on pressurized water reactors. Both computer and simple analytic models have been developed to determine the optimal coastdown length. Coastdown has been compared with the use of higher fuel-enrichment to achieve comparable burnup values. Temperature and Power coastdown modes were analyzed and changes in the plant thermodynamic efficiency determined.Effects on fuel integrity due to coastdown were examined using a fuel reliability code (SPEAR). Finally the effects on coastdown duration of major parameters involved in charaterizing reactor operation and the economic enviroment were examined.

31921 (ITEF—122(1980)) Combined iterative method for calculating the fuel burnup in nuclear reactors. Single-step kinetics. Zaritskaya, T.S.; Rudik, A.P. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Teoreticheskoj i Ehksperimental'noj Fiziki). 1980. 47p. (In Russian). NTIS (US Sales Only), PC A03/MF A01. Order Number DE82700378.

The method for calculating the nuclear fuel burnup which partially takes into account a neutron energy spectrum variation in the course of the solution of temporal equations of nuclide production kinetics is suggested. By means of this method the various spatial models for calculating spatial energy nuclear fuel burnup in the WWER-365 reactor are compared. It is shown that the actinide concentration dependence on generated power is weakly sensitive to a selection of a three-dimensional spatial model and for main actinides the calculation results coincide with a good accuracy with experimental data even in approximation of the single-step kinetics. It is concluded that the proposed combined iterative method allows to reduce essentially the number of spatial iterations and thus considerably simplies calculation of nuclear fuel burnup in the reactor ensuring high occuracy of the results.

31922 (KAERI/RR—222/80) Experiments and analysis of thermal stresses around the nozzle of the reactor vessel. Song, D.H.; Oh, J.H.; Song, H.K.; Park, D.S.; Shon, K.H. (Korea Advanced Energy Research Inst., Seoul (Republic of Korea)). 1981. 81p. (In Korean). NTIS (US Sales Only), PC A05/MF A01. Order Number DE82700385.

This report describes the results of analysis and experiments on the thermal stress around the reactor vessel nozzle performed to establish a capability of thermal stress analysis of pressure vessel subjected to thermal loadings. Firstly, heat conduction analysis during reactor design transients and analysis on the experimental model were performed using computer code FETEM-1 for the purpose of verification of FETEM-1 which was developed in 1979 and will be used to obtain the temperature distribution in a solid body under the steady-state and the transient conditions. The results of the analysis was compared to the results in the Stress Report of Kori-1 reactor vessel and those from experiments on the model, respectively.

31923 (KAERI/RR—223/80) Nuclear design and analysis for PWR. Lee, C.K.; Kim, J.S.; Lee, S.K.; Moon, K.S.; Chun, B.J.; Chang, J.W. (Korea Advanced Energy Research Inst., Seoul (Republic of Korea)). 1981. 143p. (In Korean). NTIS (US Sales Only), PC A07/MF A01. Order Number DE82700386.

The list of the developed code family in this Institute has been increased after having developed two linkage codes, namely, SHUFFLE/KIDD and LEOTOKID. The former can be harnessed to supply input burnup history data to KIDD being based on the reloading patterns at the beginning of each cycle using the concentration file of KIDD, whereas the latter is able to supply the group constants to KIDD directly from the calculated results of LEOKARD by means of tapes or disks. DOT and KENO are selected specifically for benchmarking the design methods and procedures of the nuclear design codes. On the other hand, AMPX Modular code systems have been adopted for the generation of fine-or broad-group cross-sections for these benchmark codes. Language conversion and modifications of AMPX Module are taking place at the present time.

31924 (KAERI/RR—225/80) Core management and performance analysis for PWR. Lee, J.B.; Lee, C.K.; Kim, J.S.; Lee, S.K.; Moon, K.S.; Chun, B.J.; Chang, J.W.; Kim, Y.J. (Korea Advanced Energy Research Inst., Seoul (Republic of Korea)). 1981. 110p. (In Korean). NTIS (US Sales Only), PC A06/MF A01. Order Number DE82700387.

The KINS (KAERI Improved Nodal Simulation) program, a three-dimensional nodal simulation code for pressurized water reactor fuel management, has been developed and benchmarked against the cycles 1 and 2 of the Kori-1 reactor. The critical boron concentration and three-dimensional power distribution at BOL, HZP condition have been calculated and compared with the operating data. A three-dimensional depletion calculation at HFP condition has been performed for cycle 1 with an interval of 1000 MWD/MTU and compared with the operating data. Similar calculation was also performed for cycle 2 and then compared with the design data of the reactor vendor. At the same time, a prediction of in-core detectors reaction rate was made so as to be compared with the operating data. As the result of comparisons, our calculation as well as the justification of the correlations is shown to be in excellent agreement with the operating data within an allowable limit.

31925 (KAERI/RR—226/80) Improvement of failed fuel detection system of light water reactor. Chung, M.K.; Kang, H.D.; Cho, S.W.; Lee, K.W. (Korea Advanced Energy Research Inst., Seoul (Republic of Korea)). 1981. 160p. (In Korean). NTIS (US Sales Only), PC A08/MF A01. Order Number DE82700388.

Multi-task DAAS system by utilizing PDP-11/23 computer was assembled and tested for its performances. By connecting four Ge(Li) detectors to this DAAS, test experiments were done to prove system capability for detection and analysis of any fission gases resolved in four independently sampled primary cooling water from a power reactor. Appropriate computer programs were also introduced for this application and satisfactory results were obtained. Further application of this DAAS to the quality test of fuel pins (uniform distribution of enriched uranium in fresh fuel pellets), a prototype fuel scanner system was designed, constructed and tested. Operational principle of this system is based on the determination of $^{235}U/^{238}U$ abundance ratio in pellets by precision spectrometry or gamma-rays which are emitted from a portion of fuel pellets. For the uniform scanning, rotational and traverse motions at pre-selected speeds were applied to a fuel pin under tests. A long lens magnetic beta-spectrometer of Argonne National Laboratory was transferred to KAERI and re-installed for future precision beta-gamma spectroscopic research works on short-lived fission products nuclei.

31926 (KAERI/RR—243/80) Fabrication of PWR fuel assembly and CANDU fuel bundle. Lee, G.S.; Suh, K.S.; Chang, H.I.; Chung, S.H. (Korea Advanced Energy Research Inst., Seoul (Republic of Korea)). 1980. 180p. (In Korean). NTIS (US Sales Only), PC A09/MF A01. Order Number DE82700396.

For the project of localization of nuclear fuel fabrication, the R and D to establish the fabrication technology of CANDU fuel bundle as well as PWR fuel assembly was carried out. The suitable boss height and the prober Beryllium coating thickness to get good brazing condition of appendage were studied in the fabrication process of CANDU fuel rod. Basic Studies on CANLUB coating method also were performed. Problems in each fabrication process step and process flow between steps were reviewed and modified. The welding conditions for top and bottom nozzles, guide tube, seal and thimble screw pin were established in the fabrication processes of PWR fuel assembly. Additionally, some researches for a part of PWR grid brazing problems are also carried out.

31927 (KURRI-TR—197) Research report on fuel failure in Mihama Unit 1 nuclear power plant. Shibata, T.; Sagane, T. (eds.). (Kyoto Univ., Kumatori, Osaka (Japan). Research Reactor Inst.). Mar 1980. 112p. (In Japanese). (CONF-7811197—). NTIS (US Sales Only), PC A06/MF A01. Order Number DE82780220.

From Study meeting on fuel failure in Mihama Unit 1 nuclear power plant; Kumatori, Osaka, Japan (29 Nov 1978).

Separate abstracts are presented for each of the papers included in the data base.

31928 (LA—9125-MS) Calculated neutron-source spectra from selected irradiated PWR fuel assemblies. Rinard, P.M.; Bosler, G.E.; Phillips, J.R. (Los Alamos National Lab., NM (USA)). Dec 1981. Contract W-7405-ENG-36. 20p. NTIS, PC A02/MF A01. Order Number DE82007082.

The energy spectra of neutrons emitted from a pressurized-water-reactor fuel assembly have been calculated for a variety of exposures and cooling times. They are presented in graphical form. Some effects of initial enrichment are also included. Neutrons from spontaneous fissions were given either a Maxwellian temperature of 1.2 or 1.5 MeV, depending on whether they were due to plutonium and uranium nuclides or curium nuclides. A single (α,n) spectrum was deemed sufficient to represent the neutrons from all the alpha-emitting nuclides. The proportions of the nuclides undergoing spontaneous fission and those emitting alpha particles were determined from calculated atom densities. The particular pressurized-water-reactor fuel assembly assumed for this purpose was of the type used in the H.B. Robinson Unit-2 power plant (740 MWe).

31929 (NUREG/CR—2204-Vol.3) Advanced two-phase instrumentation program. Quarterly progress report, July-September 1981. Hardy, J.E.; Miller, G.N.; Rogers, S.C.; Zabriskie, W.L. (Oak Ridge National Lab., TN (USA)). Jan 1982. Contract W-7405-ENG-26. 19p. (ORNL/TM—8162). NTIS, PC A02/MF A01. Order Number DE82005655.

The performance of the Westinghouse Reactor Vessel Level Indicating System (RVLIS) in the S-UT-3 test (a communicative break in the cold leg of Semiscale) was analyzed. The Westinghouse RVLIS gave similar indications to Semiscale Test Facility instrumentation measuring the same phenomena [differential pressure (dP)] over equal spans. The Westinghouse measurement is apparently conservative when compared with the two-phase froth level. These dP measurements appear to be nonconservative estimates of level, however, when the measurement system spans the upper core support plate. Level measurement errors of up to 150 cm (60 in.) were observed during S-UT-3. Westinghouse claims that these differences are caused by differences between Semiscale and Westinghouse Reactors. A recommendation for resolving these differences is made.

31930 Recent experience in inservice examinations. Richter, S.W.; Meridith, W.R. (Southwest Res Inst, San Antonio, Tex). *American Society of Mechanical Engineers, [Paper]*; No. 81-NE-1, vp(Jun 1981).

During 1980, Southwest Research Institute performed numerous inservice examinations of pressurized and boiling water reactor nuclear plants as well as pre-service baseline examinations of three nuclear reactor vessels. These activities included scheduled and unscheduled examination efforts ranging in extent from 12 man-days to 71 man-weeks. This paper discusses experiences related to these recent inservice examinations performed by the Institute.

31931 **Computer intelligence design for automatic inspection of steam generator tubes.** Flora, J.H. (Babcock and Wilcox Co, Lynchburg, Va). *American Society of Mechanical Engineers, [Paper];* No. 81-NE-2, vp(Jun 1981).

Eddy current inspection is the primary method of interrogating pressurized water reactor steam generator tubes during service outages. This conventional method of inspection is relatively slow and subject to error particularly when the eddy current signals are distorted by variable tube conditions. This paper describes computer intelligence systems that can be used to improve the precision of inspection and reduce inspection time and costs. Analysis programs were used to extract eddy current signals, select signal features, synthesize network estimators and train pattern classifiers. 9 refs.

31932 **Fluid-structure interaction--a survey with emphasis on its application to nuclear steam system design.** Au-Yang, M.K.; Galford, J.E. (Babcock and Wilcox Co, Lynchburg, Va). *HTD [Publication] (American Society of Mechanical Engineers);* **46**: 1-18(1981). (CONF-810625—).

From ASME PVP conference; Denver, CO, USA (21 Jun 1981).

The development of fluid-structure interaction methodologies as applied to nuclear steam system design is reviewed and classified according to whether the system is strongly or weakly coupled. Different numerical methods are compared. The effect of fluid-structure interaction on flow-induced vibration, seismic response, and response to loss-of-coolant accidents in an NSS is discussed. 48 refs.

31933 **Normal modes of a coupled fluid-shell system.** Au-Yang, M.K. (Babcock and Wilcox Co, Lynchburg, Va). *HTD [Publication] (American Society of Mechanical Engineers);* **46**: 105-118(1981). (CONF-810625—).

From ASME PVP conference; Denver, CO, USA (21 Jun 1981).

The coupled normal modes of a finite fluid-cylindrical shell system are studied in a general sense to include frequencies above the coincidence frequency. It was found that the effect of fluid on the shell is always that of an added mass. Above the coincidence frequency, the added mass can be positive or negative. In the latter case, the effect of the fluid on the shell is springlike. The added mass approaches infinity at the hardwall acoustic resonant frequencies of the fluid, representing infinitely large pressure induced on the fluid as a result of the shell motion. Coupled normal modes of a finite fluid-shell system always exist. The number of coupled normal modes of the system is equal to the number of hardwall acoustic modes of the fluid plus the number of in-vacuum shell modes. The fundamental mode of the system has a frequency that is equal to or less than the lowest of the acoustic or in-vacuum shell mode frequencies; this is usually referred to as the "in-fluid" shell mode. The higher coupled modes have frequencies close to the hardwall acoustic modal frequencies and are usually referred to as acoustic modes. Just as a light fluid does not affect the modal frequencies of the shell, so the shell flexibility does not affect the acoustic modal frequencies of a light fluid. This last statement is verified by experimental observation. A numerical example is given for the coupled oscillation of the internal component of a pressurized water reactor and the coolant surrounding it. 6 refs.

31934 **Snubber design applications.** Jirak, G.T.; Braff, C.L. (Pac Gas and Electr Co, Avila Beach, Calif). *HTD [Publication] (American Society of Mechanical Engineers);* **55**: 23-46(1981).

This paper discusses field and construction related problems encountered with snubber design applications resulting from intensive surveillance inherent in the nuclear industry. The specific problems addressed in this paper relate to both hydraulic and mechanical snubbers. Special test equipment onsite includes a hydraulic test bench and separate shop facilities for complete repair of hydraulic units. Test results for specific conditions at the site are presented, along with discussion of additional problems encountered during snubber installations.

31935 **(INIS-mf—6840) PWR reactors for BBR nuclear power plants.** (Brown Boveri Reaktor G.m.b.H., Mannheim (Germany, F.R.)). [nd]. 34p. (In German). NTIS (US Sales Only), PC A03/MF A01. Order Number DE82780203.

Structure and functioning of the nuclear steam generator system developed by BBR and its components are described. Auxiliary systems, control and load following behaviour and fuel management are discussed and the main data of PWR given. The brochure closes with a perspective of the future of the Muelheim-Kaerlich nuclear power plant. (GL).

2103 Power Reactors, Non-breeding, Graphite Moderated

REFER ALSO TO CITATION(S) 32018, 32040

31936 **(FEI—1089) Evaluation of the axial elongation of a can of a fuel rod in the RBMK-type reactor under the conditions of cyclic power variation.** Likhachev, Yu.I.; Popov, V.V.; Nikolaev, V.A.; Khmelevskii, M.Ya.; Kalinin, V.V.; Filippov, V.N. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Obninsk. Fiziko-Ehnergeticheskij Inst.). 1980. 26p. (In Russian). NTIS (US Sales Only), PC A03/MF A01. Order Number DE82700377.

A calculational statistical model (on the basis of the Monte Carlo method) of stress-deformed state kinetics for the can of the fuel element with ceramic fuel (UO_2 pellets), working under conditions of thermal cycling is developed. The results, obtained during in pile tests of the RBMK-type reactor fuel elements are given. Accumulation of nonreversible fuel can axial elongation during transient reactor operation is studied. Using the developed model, all experimental results, obtained during in pile tests of the fuel elements, are satisfactorily described. The main contribution into the nonreversible can elongation is made by the material creep during operation at the constant power level. The method developed can ve applied for calculational statistical estimation of the can nonreversible axial elongation kinetics for fuel rods with UO_2 pellet at transients for both operating and designed reactors.

31937 **(GA-A—16558) US/FRG umbrella agreement for cooperation in GCR development. Fuel, fission products, and graphite subprogram. Quarterly status report, July 1, 1981-September 30, 1981.** Turner, R.F. (General Atomic Co., San Diego, CA (USA)). Oct 1981. Contract AT03-76ET35300. 21p. NTIS, PC A02/MF A01. Order Number DE82005765.

This report describes the status of the cooperative work being performed in the Fuel, Fission Product, and Graphite Subprogram under the HTR-Implementing Agreement of the United States/Federal Republic of Germany Umbrella Agreement for Cooperation in GCR Development. The status is described relative to the commitments in the Subprogram Plan for Fuel, Fission Products, and Graphite, Revision 3, April 1981. The work described was performed during the period July 1, 1981 through September 30, 1981 in the HTGR Base Technology Program at Oak Ridge National Laboratory, the HTGR Fuel and Plant Technology Programs at General Atomic Company, and the Project HTR-Brennstoffkreislauf of the Entwicklungsgemeinschaft HTR at KFA Julich, HRB Mannheim, HOBEG Hanau and SIGRI Meitingen.

2104 Power Reactors, Non-breeding, Otherwise Moderated Or Unmoderated

REFER ALSO TO CITATION(S) 31926

31938 **(INIS-mf—6612) Heat exchanger reliability. Proceedings of a seminar.** (Canadian Nuclear Association, Toronto, Ontario). 1980. 183p. (CONF-8005190—(Pt.2)). NTIS (US Sales Only), PC A09/MF A01. Order Number DE82780020.

From Canadian Nuclear Association heat exchanger reliability seminar; Toronto, Canada (1 May 1980).

Separate abstracts for each of the presented conference papers are indluded in the data base.

31939 (KAERI/RR—236/80) Manufacturing process of UO_2 pellets. Kang, Y.H.; Lee, K.A.; Chung, S.T.; Kim, B.G.; La, S.H.; Shin, W.C.; Park, D.K. (Korea Advanced Energy Research Inst., Seoul (Republic of Korea)). 1981. 78p. (In Korean). NTIS (US Sales Only), PC A05/MF A01. Order Number DE82700446.

To perform the localization project of WOLSUNG reactor fuel, mass-production system of irradiation-stable and sound fuel pellet must be established. The following subjects have been carried out to set up CANDU fuel fabrication process for continuous production. The UO_2 powder from AUC process was mixed with 0,5,10 and 15 W/O of U_3O_8, and directly pelletized without granulation process by the pressures of 0.8,2.1,2.8,3.0, and 3.6 t/cm^2. Density and microstructure of the pellet were measured after sintered at 1700°C in hydrogen atmosphere. The UO_2 powder was pelletized with different dies and punches, and the cause of pelletizing failure is described in respect to the shapes of dies and punches. To finish centerless grinding by one pass, the diameter of new designed die nib is changed from 15.20 mm to 14.91 mm. The cause of UO_2 loss and improving method to minimize the UO_2 loss at each process are described.

31940 (KAERI/RR—238/80) Manufacturing of laboratory equipments. Nahm, K.J.; Kim, Y.M.; Cho, D.S.; Oh, H.K.; Yuk, K.H.; Cho, K.H.; Cho, Y.M. (Korea Advanced Energy Research Inst., Seoul (Republic of Korea)). 1981. 56p. (In Korean). NTIS (US Sales Only), PC A04/MF A01. Order Number DE82700447.

A design of an automatic machine to manufacture components as well as an automatic system for assembly were developed. The designs and system developed are as follows: designs of automatic tack welder in the process of CANDU fuel fabrication; cam design for plug manufacturing lathe; design, mold and fabrication of tool machine for the components of CANDU fuel bundle; and service another division.

31941 (KAERI/RR—242/80) Nuclear fuel design. Design and fabrication of a CANDU-600 fuel 3-element bundle for an irradiation test. Such, H.C.; Ha, Y.J.; Kim, H.S.; Suh, K.S.; Koh, B.R. (Korea Advanced Energy Research Inst., Seoul (Republic of Korea)). 1980. 322p. (In Korean). NTIS (US Sales Only), PC A14/MF A01. Order Number DE82700379.

In this year, this Division analyzed the thermal-mechanical behaviour of the fuel rods and developed the so-called TRIGA-HYDRO computer code to be used for the thermal-hydraulic analysis of TRIGA Mark III reactor providing the loading of our test bundle which is already designed and manufactured and so will be loaded into the reactor in May, 1981. In addition, this Division designed a shipping cask for the spent fuel with consideration of the structure of our planned post-irradiation examination facility which will be completely constructured in the end of 1982. In the next year, this Division will carry on research and development activities in the areas of CANDU fuel design and will develop computer codes particularly for use in design and performance analysis of Korean test bundles which will be irradiated at CANDU-PHWR-600 Wolsung 1 power station in 1983.

2105 Power Reactors, Breeding

REFER ALSO TO CITATION(S) 31956, 31975, 31996, 32034, 32035, 32036, 32037, 32038, 32041, 32173

31942 (AERE-R—10095) Calculations of the reflection and transmission of ultrasound by rough sodium-filled defects in steel. Temple, J.A.G. (UKAEA Atomic Energy Research Establishment, Harwell. Theoretical Physics Div.). Jul 1981. 56p. NTIS (US Sales Only), PC A04/MF A01. Order Number DE82901337.

Calculations have been made to determine the reflection and transmission coefficients of rough planar defects for ultrasonic elastic waves. Results are presented for 2.25 MHz waves of all three independent polarizations (often denoted P, SV, and SH-waves). The work supplements that already available on the reflection properties of flat, parallel-sided slots filled with either liquid or solid sodium. The roughness is treated as a perturbation, to first order in the root mean-square height, from the exactly soluble case of a flat and parallel sided slot. The theory and results presented are valid for the case where the two sides of the defect are separated by much more than the root mean square roughness and the defect contains a solid or a liquid. A typical result is that for a 20μ separation of the defect faces, each of which has a 10μ rms roughness, then the P-wave reflection coefficient at 2.25 MH/sub z/ is reduced by 20% from its value calculated for smooth, flat and parallel faces, even at normal incidence.

31943 (CONF-811103—69) Analysis of the lumped fission-product uncertainty in CRBR. White, J.R.; Schenter, R.E. (Oak Ridge National Lab., TN (USA); Hanford Engineering Development Lab., Richland, WA (USA)). 1981. Contract W-7405-ENG-26. 9p. NTIS, PC A02/MF A01. Order Number DE82004056.

From ANS winter meeting; San Francisco, CA, USA (29 Nov 1981).

An approximation made in most fast reactor analyses is to utilize a single lumped fission product (FP) cross-section set to represent the total effect of the approximately 800 possible fission product nuclides in a depleted reactor model. Recent investigations have analyzed several aspects of this one-lump approximation (burnup dependence, comparison with a two-lump model, etc.), but little has been done in addressing the quality, or uncertainty, in the basic cross-section data utilized in any such representation. Thus, the purpose of this study is to investigate the uncertainty in the FP reactivity effect due to the data uncertainties inherent in an ENDF/B-V composite FP representation specifically designed for application with the current CRBR heterogeneous core concept.

31944 (EUR—7008) Neutronic transmutation of transuranium isotopes in a fast neutron power reactor. Oliva, G. (Commission of the European Communities, Ispra (Italy). Joint Research Centre). 1981. 72p. (In Italian). NTIS (US Sales Only), PC A04/MF A01. Order Number DE81700896.

Starting from the theoretical basis of the transmutation, calculations of homogeneous recycling and heterogeneous configurations for a 1200 MWe LMFBR are executed. The most important aspects examined are: determination of the amounts of Transuranium isotopes (TRU) generated in the reactor; determination of the amounts of TRU which can be eliminated at every transmutation step, i.e. at every cycle; - determination of the factors which have most influence on the efficiency of the transmutation process; and evaluation of the consequences of the TRU recycling for the reactor design parameters.

31945 (FEI—1061) Electrochemical cell for measuring oxygen activity in liquid sodium. Kozlov, F.A.; Kuznetsov, Eh.K.; Vorob'ev, T.A. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Obninsk. Fiziko-Ehnergeticheskij Inst.; Zentralinstitut fuer Kernforschung, Rossendorf bei Dresden (German Democratic Republic)). 1980. 17p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700439.

The results of co-investigations performed by CINR (GDR) and PhEhI (USSR) in developing electrochemical cells with solid electrolite for continuous oxygen activity control in sodium are generalized. The conditions and results of testing the cells on an experimental benchmark and the BR-10 reactor are described. Under non-stationary operating modes of the benchmark (Na temperature approximately 400 deg C, Na flow rate approximately 0.1-1 m^3/h; sodium pressure 0.2-6 atm, oxygen concentration approximately 1 p.p.m) the cells lifetime was about 1000-2000 h. The average concentration coefficient remains constant within the errors during the lifetime. The cell temperature coefficient is small and for the most cells falls into the range from +0.3 to -0.3 mV/K. The hydrogen effect is also small approximately +1.5 mV per 1 p.p.m. of H_2. No effect of ^{24}Na irradiation on the cell readings while operating in the BR-10 reactor cooling circuit has been observed. The results prove, that the design of the cell meets the requirements of reactor cooling circuits.

31946 **(IAE—3288/5) Semianalytical method of nonstationary thermal problem solution for a pipeline with an incompressible coolant.** Garin, V.P.; Kukharkin, N.E.; Skorlygin, V.V.; Yanushevich, I.V. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Atomnoj Ehnergii). 1980. 22p. (In Russian). NTIS (US Sales Only), PC A11/MF A01. Order Number DE82700370.

A semianalytical method of non stationary heat transfer problem for nuclear power plant with coolant loops is proposed. In adiabatic approximation under assumptions well proved for the case of the liquid metal coolant flow with high velocities in not thick pipes, a simple non stationary equation of heat transfer in the pipe with an incompressible coolant is derived. By Laplace transformation method a solution of the derived equation for real loop elements at arbitrary perturbation by the coolant temperature at the inlet and heating is obtained. On the described algorithm basis a program for the BESM-6 computer making possible performing calculations of a wide class of transients is worked out. The conclusion is drawn that the proposed method provides high calculation rate and requires moderate computer storage size.

31947 **(KFK—2856) Steady-state, local temperature fields with turbulent sodium flow in nominal and disturbed bundle geometries with spacer grids.** Moeller, R.; Tschoeke, H.; Kolodziej, M. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Inst. fuer Reaktorbauelemente; Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Projekt Schneller Brueter). Dec 1980. 27p. (In German). NTIS (US Sales Only), PC A03/MF A01. Order Number DE82780093.

The operating reliability of nuclear reactors calls for a reliable strength analysis of the highly loaded core elements, one of its prerequisites being the reliable determination of the three-dimensional velocity and temperature fields. To verify thermohydraulics computer programs, extensive local temperature measurements in the rod claddings of the critical bundle zone were performed on a heated 19-rod bundle model with sodium flow and provided with spacer grids (P/D = 1.30; W/D = 1.19). These are the essential results obtained: Outside the spacer grids the azimuthal temperature variations of the side and corner rods are greater by approximately the factor 10 in the bundle geometry under consideration as compared to rods in the central bundle zone. The spacer grids investigated give rise to great local temperature peaks and correspondingly great temperature gradients in the axial and azimuthal directions immediately around the support points. Continuous reduction of a subchannel by rod bowing results in substantial rises of temperature which, however, are limited to the adjacent cladding tube zones.

31948 **(PNL-SA—9441) Validation study of COBRA-WC for LMFBR steady-state and transient analysis.** Khan, E.U.; Prather, W.A.; George, T.L.; Bates, J.M.; Cheatham, R.L. (Pacific Northwest Lab., Richland, WA (USA)). Mar 1981. Contract AC06-76RL01830. 13p. (CONF-810804—23). NTIS, PC A02/MF A01. Order Number DE82005979.

From 20. national heat transfer conference; Milwaukee, WI, USA (2 Aug 1981).

The COBRA-WC computer program is being widely used to predict flow and temperature fields in LMFBR rod bundles. Since the code is being used to benchmark other simpler codes, a validation study has been conducted to reinforce its credibility. A set of generalized parameters was shown to predict data well for a wide range of geometries and operating conditions which extend from typical (of small size LMFBRs) fuel assembly to typical blanket assembly geometry and forced mixed and natural convection regimes. The data base used for validating COBRA-WC was obtained from out-of-pile and in-pile tests in wire-wrapped pin bundles in which the pins are arranged in a triangular array. The test bundles were fully heated bundles of 61 pins or less, with bundle power skew less than 3:1 (max./min.), Reynolds number between 500 and 80,000, and mixed mean temperature rise (Δ anti T) greater than 70°F.

31949 **Data analysis and analytical predictions of a steam generator tube bundle flow field for verification of 2-D T/H computer code.** Hwang, J.Y.; Reid, H.C.; Berringer, R. (Westinghouse Electr Corp, Tampa, Fla). *American Society of Mechanical Engineers, [Paper];* No. 81-JPGC-NE-1, vp(Oct 1981).

Analytical predictions of the flow field within a 60 deg segment flow model of a proposed sodium heated steam generator are compared to experimental results obtained from several axial levels between baffling. The axial/crossflow field is developed by use of alternating multi-ported baffling, accomplished by radial perforation distribution. Radial and axial porous model predictions from an axisymmetric computational analysis compared to intra-pitch experimental data at the mid baffle span location for various levels. The analytical mechanics utilizes a cylindrical, axisymmetric, finite difference model, solving conservation mass and momentum equations. 6 refs.

31950 **Double-wall tube steam generator for breeder nuclear plants.** Adkins, C.R.; Bongaards, D.J.; Smith, P.G. (Westinghouse Electr Co, Tampa, Fla). *American Society of Mechanical Engineers, [Paper];* No. 81-JPGC-NE-2, vp(Oct 1981).

The Westinghouse steam generator concept, chosen for breeder reactor application, provides a double barrier between the two heat transfer fluids. This barrier consists of double-wall tubes with third-fluid (helium) leak detection capability and double (redundant) tube-to-tubesheet welds at both ends of the unit. The paper describes the design and analysis of the steam generator under breeder reactor operation either in a once-through mode or under recirculating cycle conditions, including the development and testing activities to verify the design. 5 refs.

31951 **Operating experience of the EBR-II steam generating system.** Buschman, H.W.; Penney, W.H.; Quilici, M.D.; Radtke, W.H. (Argonne Natl Lab, Idaho Falls, Idaho). *American Society of Mechanical Engineers, [Paper];* No. 81-JPGC-NE-4, vp(Oct 1981).

The Experimental Breeder Reactor II (EBR-II) is a Liquid Metal Fast Breeder Reactor (LMFBR) with integrated power producing capability. Superheated steam is produced by eight natural circulation evaporators, two superheaters, and a conventional steam drum. Steam throttle conditions are 438 C (820 F) and 8.62 MPa (1250 psi). The designs of the evaporators and superheaters are essentially identical; both are counterflow units with low pressure nonradioactive sodium on the shell side. Safety and reliability are maximized by using duplex tubes and tubesheets. The performance of the system has been excellent and essentially trouble free. The operating experience of EBR-II provides confidence that the technology can be applied to commercial LMFBR's for an abundant supply of energy for the future. 5 refs.

31952 **LMFBR designs for the twenty-first century.** Sharbaugh, J.E. (Westinghouse Electr Corp). *American Society of Mechanical Engineers, [Paper];* No. 81-PVP-29, vp(Jun 1981).

In 1979, the Conceptual Design Study (CDS) program was established by the Department of Energy to essentially reevaluate the LMFBR program for the United States The major reactor manufacturers were asked to prepare conceptual designs for both pool and loop type reactors. This paper presents two 1000 MWe designs evlved by one of those manufacturers as a part of their involvement in the CDS program. 1 ref.

31953 **Experimental benchmark for piping system dynamic response analyses.** Schott, G.A.; Mallett, R.H. (Westinghouse Electr Corp, Madison, Pa). *HTD [Publication] (American Society of Mechanical Engineers);* **49**: 71-78(1981).

The scope and status of a piping system dynamics test program are described. A 0.20-m nominal diameter test piping specimen is designed to be representative of main heat transport system piping of LMFBR plants. Attention is given to representing piping restraints. Applied loadings consider component-induced vibration as well as seismic excitation. The principal objective of the program is to provide a benchmark for verification of piping design

methods by correlation of predicted and measured responses. Pretest analysis results and correlation methods are discussed. 3 refs.

2107 Regulation And Licensing

REFER ALSO TO CITATION(S) 32018

2108 Economics

REFER ALSO TO CITATION(S) 31902, 31903, 31918, 31920

31954 **(ERGONOMRAAD-R—18) Knowledge structures for process operators.** Wirstad, J. (Ergonomiraad AB, Karlstad (Sweden)). May 1981. 29p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE81701003.

A conceptual framework for operator competency and job training planning and design being developed and used for operators in Swedish nuclear power stations is presented briefly. This conceptual framework represents a training technological approach. It uses terms which are system oriented and familiar to people working in the plant. Another conceptual framework is focusing on the information processing of the operator and its relation to physical, functional and abstract representations of the plant and the process. This conceptual framework has been developed by Risoe in Denmark especially for man process-interaction analysis and design. There are interesting relations between the two structures, e.g. human information processing in plant operation is largely a function of operator learning of the work, the processes and the plants units, its subsystems and components. The two framework are analysed and relations between them are indicated.

31955 **(LA—9052-MS) Decommissioning the Los Alamos Molten Plutonium Reactor Experiment (LAMPRE I).** Harper, J.R.; Garde, R. (Los Alamos National Lab., NM (USA)). Nov 1981. Contract W-7405-ENG-36. 15p. NTIS, PC A02/MF A01. Order Number DE82007030.

The Los Alamos Molten Plutonium Reactor Experiment (LAMPRE I) was decommissioned at the Los Alamos National Laboratory, Los Alamos, New Mexico, in 1980. The LAMPRE I was a sodium-cooled reactor built to develop plutonium fuels for fast breeder applications. It was retired in the mid-1960s. This report describes the decommissioning procedures, the health physics programs, the waste management, and the costs for the operation.

31956 **(ORNL/TM—8061) Graphical and tabular summaries of decay characteristics for once-through PWR, LMFBR, and FFTF fuel cycle materials.** Croff, A.G.; Liberman, M.S.; Morrison, G.W. (Oak Ridge National Lab., TN (USA)). Jan 1982. Contract W-7405-ENG-26. 144p. NTIS, PC A07/MF A01. Order Number DE82007128.

Based on the results of ORIGEN2 and a newly developed code called ORMANG, graphical and summary tabular characteristics of spent fuel, high-level waste, and fuel assembly structural material (cladding) waste are presented for a generic pressurized-water reactor (PWR), a liquid-metal fast breeder reactor (LMFBR), and the Fast Flux Test Facility (FFTF). The characteristics include radioactivity, thermal power, and toxicity (water dilution volume). Given are graphs and summary tables containing characteristic totals and the principal nuclide contributors as well as graphs comparing the three reactors for a single material and the three materials for a single reactor.

31957 **(RISO-M—2301) Simulator training analysis. A proposal for combined trainee debriefing and performance data collection.** Hollnagel, E.; Rasmussen, J. (Risoe National Lab., Roskilde (Denmark)). Aug 1981. 60p. NTIS (US Sales Only), PC A04/MF A01; Also available from Risoe Library, DK-4000 Roskilde, Denmark. Order Number DE81701004.

This paper presents a suggestion for systematic collection of data during the normal use of training simulators, with the double purpose of supporting trainee debriefing and providing data for further theoretical studies of operator performance. The method is based on previously described models of operator performance and decision-making, and is a specific instance of the general method for analysis of operator performance data. The method combines a detailed transient-specific description of the expected performance with transient-independent tools for observation of critical activities.

2109 Process Heat Reactors

REFER ALSO TO CITATION(S) 32018

31958 **(NIIAR—15(468)) Technological testing of a district heating benchmark at the VK-50 reactor.** Shmelev, V.E.; Zabelin, A.I.; Yuzhanin, V.I.; Letnitskii, Yu.A.; Baklanov, S.G.; Voronkov, G.G.; Eshcherkin, V.M.; Nikolaeva, S.A. (Nauchno-Issledovatel'skij Inst. Atomnykh Reaktorov, Dimitrovgrad (USSR)). 1981. 13p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700332.

A special district heating benchmark constructed at the VK-50 reactor with the purpose of creating an experimental base for solution of scientific and technical problems arising in the course of developing the nuclear power plants for district heating is described. The results of the main benchmark equipment testing and studying its water chemical and radiation conditions are presented. The benchmark is intended for heating the VK-50 reactor building (heat consumption up to 3.6 Gcal/h) secondary steam supply to the turbine seals (1.6 Gcal/h). The performed investigations have shown that for heating conditions when irreversible steam losses are excluded the requirements for the secondary circuit feedwater quality can be substantially lowered. The three-circuit benchmark design proper choice of working pressure in each circuit and using steam coolant in the heat exchanger circuit provide the necessary radiation safety of heat supplying circuit. It is concluded that the technological scheme and the described benchmark equipment ensure sufficient reliability and high efficiency of the heating system.

22 NUCLEAR REACTOR TECHNOLOGY

2201 Theory And Calculation

REFER ALSO TO CITATION(S) 32052, 32776

31959 **(CONF-811103—68) CARDIOGRAMA: a stochastic, semi-empirical methodology for power-reactor surveillance and diagnostics.** March-Leuba, J.A.; deSaussure, G.; Perez, R.B. (Oak Ridge National Lab., TN (USA)). 1981. Contract W-7405-ENG-26. 6p. NTIS, PC A02/MF A01. Order Number DE82004057.

From ANS winter meeting; San Francisco, CA, USA (29 Nov 1981).

The utilization of stochastic methods (reactor noise) for power reactor diagnostics and surveillance applications is by now a relatively well-established technique. In this technique, the power spectral density (PSD) of the fluctuations of a specified state variable is often used to define the reactor's signature at a given configuration. The purpose of the present work is to address the problem of handling efficiently the substantial amount of information involved in the application of reactor surveillance and diagnostics methods. Specifically, a methodology is described for: (a) representing the PSDs parametrically, and (b) detecting changes from the reactor's baseline PSD (normal signature).

31960 **(CTA-EAV—007/79) Decay constants of a subcritical system by two-group diffusion theory.** de Moura Neto, C. (Centro Tecnico Aeroespacial, Sao Jose dos Campos (Brazil). Inst. de Atividades Espaciais). Aug 1979. 31p. (In Portuguese). NTIS (US Sales Only), PC A03/MF A01. Order Number DE81700994.

The effects of a neutronic pulse applied to a subcritical multiplicative medium are analyzed on the basis of the diffusion theory for one and two groups. The decay constants of the system were

determined from the experimental data, for various values geometric buckling. A natural uranium light-water configuration was pulsed employing a Texas Nuclear 9905 neutron generator. The least square method was employed in the data reduction procedures to determine the decay constants. The separation of the decay constants associated with thermal and epithermal fluxes are verified through two groups formulation.

31961 **(CTA-EAV—024/79) Fast neutron physics. Estimation of the results of diffusion theory applied to small dimension systems.** de Moura Neto, C.; do Amorim, E.S. (Centro Tecnico Aeroespacial, Sao Jose dos Campos (Brazil). Inst. de Atividades Espaciais). Dec 1979. 27p. (In Portuguese). NTIS (US Sales Only), PC A03/MF A01. Order Number DE82700361.

Finite systems of small dimensions were investigated in comparison with systems where the diffusion theory is valid with reasonable precision. Elaborated methods were introduced for the study of small systems, based on different approximations of the neutron transport equation. Experimental data, obtained from the literature, were compared with values by the ANISN-DLC/2D system.

31962 **(CTA-EAV-NT—011/79) Heterogeneous reactors.** de Moura Neto, C.; Nair, R.P.K. (Centro Tecnico Aeroespacial, Sao Jose dos Campos (Brazil). Inst. de Atividades Espaciais). Aug 1979. 33p. (In Portuguese). NTIS (US Sales Only), PC A03/MF A01. Order Number DE81700996.

The microscopic study of a cell is meant for the determination of the infinite multiplication factor of the cell, which is given by the four factor formula: K(infinite) = n(epsilon)pf. The analysis of an homogeneous reactor is similar to that of an heterogeneous reactor, but each factor of the four factor formula can not be calculated by the formulas developed in the case of an homogeneous reactor. A great number of methods was developed for the calculation of heterogeneous reactors and some of them are discussed.

31963 **(FEI—1079) Ksub(eff) calculation by the variable separation method.** Shulepin, V.S. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Obninsk. Fiziko-Ehnergeticheskij Inst.). 1980. 8p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700363.

The problem on reduction of two-dimensional calculation of the effective neutron multiplication factor Ksub(eff) for cylindrical reactor with an uniform core to one-dimensional calculations in axial and radial directions is considered. The relation connecting the two-dimensional reactor Ksub(eff) one-dimensional reactors Ksub(eff) and the neutron multiplication factor Ksub(infinity)in the infinite medium is obtained. By numerical calculations the possibility of using this relation is shown for the calculation of the reactor with a lightwater moderator and a lightwater reflector surrounding the reactor core. On the basis of the analysis of results obtained and their comparison with the results of calculations performed by means of the variable conditional separation method the conclusion is drawn on the applicability of the described method for calculation of reactors with a uniform reactor core of not too small dimensions. The method is efficient in case of Ksub(eff) multivariant calculations.

31964 **(FEI—1097) DOPPLER program for calculating the Doppler temperature reactivity coefficient.** Dekusar, V.M. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Obninsk. Fiziko-Ehnergeticheskij Inst.). 1980. 20p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700364.

An algorithm of calculating the Doppler temperature reactivity coefficient (TRC) for reactors with thermal and intermediate neutron spectra is considered. The methos of small perturbation theory is used for the calculation. The Doppler TRC is expressed in terms of temperature derivatives of self-shielding factors on isolate resonances which are calculated by means of a tabulated special function W(h'). Resonance parameters necessary for the calculation are taken from the library of initial data recorded on a magnetic tape. Necessary functionals of neutron flux and importance obtained according to a program of the reactor calculation in the multigroup approximation may be recorded in the library. The algorithm described is realized in the DOPPLER program in the FORTRAN-Dubna language for the BESM-6 computer. The program and instruction for users for the control task preparation are described. The initial data library and a program for operation with it are described as well. It is concluded that it is possible to account for the resonance absorber heterogeneous blocking in accordance with the equivalence theory when calculating by means of the DOPPLER program.

31965 **(FEI—1110) Computer code for calculating reactor core optimal physical performances. POISK-2.** Isakova, L.Ya.; Rachkova, D.A. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Obninsk. Fiziko-Ehnergeticheskij Inst.). 1980. 8p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700366.

The POISK-2 program (FORTRAN-Dubna, BESM-6 computer) for optimization of physical performances of one-dimensional cylindrical reactor core is described. The reactor model under consideration permits to use as manipulated variables the following values: certain geometrical characteristics of a cell; volume fractions of corresponding chemical compounds in the fuel for different core zones; volume fractions of burnable poisons in their compositions for the core zones; factors of leakage cross sections for the zones, imitating elements of control system; concentrations of certain chemical elements in physical zones where a homogenized composition of chemical elements is given. The maximum number of independent variables is equal to 20. Initial core fuel charge, initial charge of burnable poisons maximum value of the effective neutron multiplication factor in the unpoisoned state, energy release standardized field, maximum value and its values for some points along the radius, the size of iodine pit for each moment of reactor life time, accumulation of fission fragments at the end of the life time for reactor zones, reactivity of underburnout poisons, efficiency of the control system for different peis of life time, restrictions on the values of the effective neutron multiplication factors in conditions of stationary poisoning and iodine pit are considered as functionals which can be either introduced into restrictions or used as minimized values. The program suggested permits to obtain the minimum value of a choosen functional providing, at that, the operation at fixed power and fulfilment of a number of restrictions during the whole reactor life time.

31966 **(FEI—1138) To calculating plane cells by means of the $2P_0$-approximation.** Polivanskii, V.P.; Gurin, V.N. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Obninsk. Fiziko-Ehnergeticheskij Inst.). 1980. 12p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700368.

The problem on spatial energy distribution of neutron flux in plane multiplying cells between which steel, cadmium and water layers are situated is considered. The critical size of such system core is determined as enrichment function absorbing layers dimensions and relation of hydrogen nuclei number to that of uranium nuclei. At fixed core dimensions the neutron transport equation solution for the purpose of determining the neutron multiplication effective factor of the system is found in the 2Po approximation of spherical harmonics method. Calculation results illustrating the chosen approach and their comparison with the data obtained by means of other calculation techniques are presented. It is shown that the multiparametric calculations of the systems under consideration can be successfully performed within the framework of the three-group approximation by means of a described technique of automatic preparatio of blocked microconstants. Thermal neutron absorption in cadmium can be taken into account with up to 10% accuracy by means of a ssignment effective absorption constants and neutron transport in cadmium.

31967 **(HMI-B—332) Reports of the Arbeitsgruppe Neutronenstreuung.** (Hahn-Meitner-Institut fuer Kernforschung Berlin G.m.b.H. (Germany, F.R.). Bereich Neutronenstreuung). Jul 1980. 204p. NTIS, PC A10/MF A01. Order Number DE82780183.

Separate abstracts are presented for each of the papers included in the data base.

31968 **(IAE—3280/5) Derivation of the finite difference equations for a heterogeneous reactor. 1. Square lattice blocks.** Laletin, N.I.; El'shin, A.V. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Atomnoj Ehnergii). 1980. 31p. (In Russian). NTIS (US Sales Only), PC A03/MF A01. Order Number DE82700369.

General procedure for obtaining specified finite-difference equations of a heterogeneous reactor is described for the particular case of a two-dimensional reactor with a square lattice of blocks general problems on obtaining equations in geometrically regular heterogeneous lattice of cylindrical rods are discussed. The solution in a reactor cell is presented in a form of a linear combination of experimental functions satisfying inside the cell the kinetic equation and some boundary conditions. On the basis of considering an expression for an error in a certain succession of functionals investigated the equations of communication of experimental functions amplitudes in neighbouring cells are obtained. It is shown on an example of a square lattice as to how by means of an analytic exlusion of "superfluous" amplitudes from equations, the finite difference equations are obtained which describe the neutron flux macro-passage over the reactor and have the appearance of a finite-difference approximation of a diffusion equation. The whole study is carried out on the basis of a kinetic equation with a continuous energy dependence. Final finite difference equations are registered in a group approximation.

31969 **(IAE—3377/5) Computer code for neutron group calculation of a cylindrical reactor cell (NEGR-Ts).** Boyarinov, V.F. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Atomnoj Ehnergii). 1981. 27p. (In Russian). NTIS (US Sales Only), PC A03/MF A01. Order Number DE82700371.

The NEGR-Ts computer code, intended for neutron multigroup calculation of a cylindrical reactor cell is described. The algorithm of solution of the neutron transport equation with isotropic scattering in a symmetric cell with preset sources underlying in the base of the NEGR-Ts computer code is considered in detail. The method of surface pseudosources has been used for the solution. The results of the code performance testing are presented. The code is recorded in ALGOL and is meant for BESM-6 computer with the DUBNA or DISPAK operational system. It is concluded that the calculation results by the NEGR-Ts computer code agree well with the results of calculations obtained by means of the PRAKTINETs code and with the calculational results by the Monte Carlo method.

31970 **(ITEF—162(1980)) Quadratic approximation of the Payerls equation solution for multilayer cylinder. MKO program.** Kvaratskheli, A.Yu. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Teoreticheskoj i Ehksperimental'noj Fiziki). 1980. 20p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700466.

The method for solving the Payerls equation for a cylindrical region of the infinite height using approximation of a neutron flux by the function $F(r)=A(r)+r^2b(r)$, where a(r) and b(r) are piecewise constant functions, is proposed. The possibility of F(r) representation as a discontinuous and a continuous functions is studied. Calculations performed using the given method and the method of probability of the first collision (FCP) in a conventional form are compared. The proposed method for solving the Payerls equation is realized in the MKQ program written in FORTRAN for the BESM-6 computer. The program structure is described and the test calculation results are presented. It is established that the method as a whole is not effective in a system of reactor cell type. However, the method has good characteristics for estimating multizone reactors with protection.

31971 **(ITEF—164(1980)) Test calculations of physical parameters of the TRX,BETTIS and MIT critical assemblies according to the TRIFON program.** Kochurov, B.P. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Teoreticheskoj i Ehksperimental'noj Fiziki). 1980. 24p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700467.

Results of calculations of physical parameters characterizing the TRX, MIT and BETTIS critical assemblies obtained according to the program TRIFON are presented. The program TRIFON permits to calculate the space-energy neutron distribution in the multigroup approximation in a multizone cylindrical cell. Results of comparison of the TRX, BETTIS and MIT crytical assembly parameters with experimental data and calculational results according to the Monte Carlo method are presented as well. Deviations of the parameters are in the range of 1.5-2 of experimental errors. Data on the interference of uranium 238 levels in the resonant neutron absorption in the cell are given.

31972 **(JAERI-M—9235) Parallel computation for neutron diffusion equation.** Ishiguro, M.; Koshi, Y. (Japan Atomic Energy Research Inst., Tokyo). Dec 1980. 54p. (In Japanese). NTIS (US Sales Only), PC A04/MF A01. Order Number DE82700473.

The parallel computation for neutron diffusion equation is discussed, especially the three dimensional problem for which rapid calculation is demanded. The computing time for the three dimensional diffusion code is mostly consumed by the calculation of neutron diffusion equation which is approximated by seven points difference equations, refferred to as inner iteration. Hence, the diffusion code is indeed able to make effective use of parallel capability, by vectorizing the inner most loop, if possible. Mainly investigated in this report are as follows: (1) Six general methods of solution of the seven points difference equations, SOR, SLOR, Modified SLOR, ADI, Cyclic reduction algorithm and Direct method are numerically studied from the viewpoint of their adaptability for parallel computations. (2) Neutron diffusion code ADC is analyzed to vectorize. It is seen that the modified SLOR which is newly developed is best to calculating the seven points difference equations, in the sense that the method well prevents the increase of iterations. It is also seen that the computing time for the ADC code can be reduced to thirty percent by vectorizing the inner iteration with the method of SOR, if it goes well.

31973 **(JINR-R—10-80-861) Directives of the SPS spectrum processing system.** Nefed'eva, L.S.; Saltykov, A.I. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Computing Techniques and Automation). 1980. 11p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700480.

Problem-oriented directive language of the spectrum processing system (SPS) is described. It serves for formulation of user task for data processing. Statements of this language and rules of their construction are described. The SPS language has a FORTRAN-like structure. The recording of the task in the SPS language consists of separate operators, each of them begins from a keyword and is positioned on a new punched card. The task is a principal program of a job package. It includes the part of the process of data processing, which occurs on the level of files and records.

31974 **(KAERI/RR—201/80) Update and benchmark test of the LEOPARD library from ENDF/B-IV.** Kim, J.D.; Lee, J.T. (Korea Advanced Energy Research Inst., Seoul (Republic of Korea)). 1980. 125p. (In Korean). NTIS (US Sales Only), PC A06/MF A01. Order Number DE82700372.

Applicability of the updated LEOPARD library was assessed through the benchmark tests for many light water-moderated critical assemblies and the results can be summarized as follows: 1) The average values and standard deviations for the ratios of the calculated Ksub(eff) to the measured are 0.9954 and 1.52% for 44 UO_2-fueled cores, and 0.9988 and 0.93% for 15 mixed-oxide (PuO_2 - UO_2) plutonium-fueled cores. The 0.5% underprediction of Ksub(eff) for UO_2-fueled cores is very nearly the same as those

concluded by the CSEWG benchmark testing of ENDF/B-IV. 2) In order to determine library bias, an adjustment work was carried out to test the effect of Ksub(eff) values on changing the epithermal elastic scattering of U-238. As a result of the evaluation, it is performed that the average Ksub(eff) and standard deviation are 0.9999 and 0.73%, respectively. Although the updated library still leaves something to be reevaluated, it is believed to be applicable for the analysis of light water-moderated reactor cores.

31975 **(ORNL-tr—4797) DIAMANT 2: a multigroup neutron-transport program for triangular and hexagonal geometry.** Kuefner, K.; Heger, R. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Inst. fuer Neutronenphysik und Reaktortechnik). Sep 1980. Contract W-7405-ENG-26. Translation of KFK—3033, September 1980. 124p. NTIS, PC A06/MF A01. Order Number DE82005494.

DIAMANT 2 evolved out of the DIAMANT-code (developed at C.E.N./S.C.K., Mol, Belgium, B.del Marmol and G. Minsart). DIAMANT 2 solves the multigroup neutron transport equation in planar geometry using the S/sub N/ method. Spatial discretization is accomplished by taking finite differences on a mesh grid composed of equilateral triangles. This report contains a detailed documentation of the program and the input description.

2202 Components And Accessories

REFER ALSO TO CITATION(S) 31953, 31991, 31996, 32033, 32046, 32048, 32052, 32059, 32060, 32061, 32144, 32150, 32153

31976 **(AEEW-M—1830) Dynamic crushing loads of thin-walled steel tubes.** Neilson, A.J. (UKAEA Atomic Energy Establishment, Winfrith). Jan 1981. 96p. NTIS (US Sales Only), PC A05/MF A01. Order Number DE81700999.

Analysis of the extreme load behavior of structures experiencing missile impact requires estimates of impact loads to be made. This report discusses a simple model for calculating the dynamic reaction load for a soft (crushable) missile and compares the results with measurements of impact loading and tube collapse for the axial impact of steel tubes on a load cell assembly. The ratios of wall thickness to tube diameter for the steel tubes ranged from 0.0047 to 0.025 and impact velocities from 113 to 315 m/s. It is shown that a simple calculation model based on the momentum balance provides satisfactory agreement with experimental results provided appropriate attention is paid to dynamic effects on material properties.

31977 **(CEA-N—2213) Progressive buckling. First series of experiments.** Lebey, J.; Cousseran, P.; Roche, R.; Brouard, D.; Tomassian, R. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France). Dept. des Etudes Mecaniques et Thermiques). May 1981. 70p. (In French). NTIS (US Sales Only), PC A04/MF A01. Order Number DE81701000.

Effect of cyclic deformations (thermal stresses for instance) on buckling conditions of structures loaded by a primary stress is still almost unknown. An experimental study has been undertaken on simple structures loaded simultaneously by a constant compressive stress and cyclic torsion straining. Results show clearly that cyclic straining can lead progressively to buckling at compressive loads below the static critical ones.

31978 **(CNEN-DIN—01/80) Fabrication characteristics of Zircaloy tubes for nuclear reactors.** Haydt, H.M. (Comissao Nacional de Energia Nuclear de Brasil, Rio de Janeiro). Nov 1980. 34p. (In Portuguese). NTIS (US Sales Only), PC A03/MF A01. Order Number DE82700266.

The production sequence for zircaloy cladding tubes to be used in nuclear reactors is described, with emphasis on the texture after reduction and on the variation in the hydrides orientation. The qualities requested for the cladding tubes are presented and reference is made to the quality control applied in the process. The destructive tests as well as the final inspection to which those tubes are subjected are related. A Fabrication Quality Project is requested from the manufacturers by reason of what Quality Control Plans are submitted to be clients. At last an evaluation of the quality to be obtained and of the control performed is mentioned.

31979 **(FEI—1019) Program for calculating the temperature fields in constructive elements of nuclear reactors.** Shcherbakov, S.I.; Kazakova, T.Yu.; Parafilo, L.M. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Obninsk. Fiziko-Ehnergeticheskij Inst.). 1980. 20p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700362.

A generalized program for calculating three-dimensional nonstationary temperature fields for investigation of the nuclear reactor construction units is described. The calculation method of the temperature fields of the studied arbitrary three-dimensional body is based on solving thermal balance difference equations. The solution algorithm of these equations is presented, as well as construction of curvilinear orthogonal coordinates is considered. The program text is itten in FORTRAN and it is intended for operating at the ES-1030 computer. To illustrate utilization of the given program the calculation results of the temperature fields in the upper part of the reactor pressure vessel are presented. The ES-1030 computation time of the nonstationary process in the two-dimensional range for the case of sharp drop of the coolant temperature inside the vessel from 290 deg C to 220 deg C is 30 min.

31980 **(FEI—1100) Numerical technique for calculating coolant velocity and temperature fields in a nuclear reactor.** Leonchuk, N.P.; Shvetsov, Yu.E. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Obninsk. Fiziko-Ehnergeticheskij Inst.). 1980. 13p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700365.

A numerical technique for calculating nonstationary two-dimensional fields of coolant velocity and temperature in a cylindrical region having space-dependent anisotropic properties is stated. The problem is formulated within the framework of the "porous body" model and is solved in "natural" variables of "velocity-pressure". Partially implicit difference scheme is used for the approximation of the equation of motion, which permits to increase considerably an integration step in time and thus to reduce machine time expenditures. The technique suggested is tested on the solution of a number of reactor problems, in particular, in the investigation into the effect of blocking of the reactor passage section on the temperature fields and in the calculation of the natural convection process in the core. The technique may be used for the solution of a series of reactor engineering problems, for example, for analyzing the sequences of emergency overlapping of a part of the passage section in a nuclear reactor or for the investigation into the effect of the inhomogeneities and instabilities of coolant rate on the temperature field in the core. Besides, it may be used to investigate natural convection processes in a reactor.

31981 **(FEI—1104) Inertial and damping properties of a two-phase mixture with surface-active agents.** Fedotovskii, V.S. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Obninsk. Fiziko-Ehnergeticheskij Inst.). 1980. 13p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700374.

To specify the technique of calculation of oscillations of elastic constructions surrounded or containing liquid, oscillations of spherical bubbles assuming that the presence of surface-active substances provides boundary condition of liquid adhesion at its surface are considered. Relations for inertial and dissipative resistance forces, taking into account the bubble motion inconvenience in an oscillating liquid, are obtained. On the basis of the equation of bubble oscillating motion the formula is obtained for the two-phase mixture dynamic density taking into account volumetric gas content of mixture, bubble size liquid viscosity and oscillation frequency. Body oscillations with a cavity containing a two-phase bubble mixture are considered and the relation for the hydrodynamic damping coefficient du to dissipative losses in boundary layers at oscillating in relation to the liquid bubbles is obtained. The above results spread over the case of pipeline vibrations with the occuring two-phase bubble flow.

31982 **(FEI—1128) Droplet size effect on heat and mass transfer characteristics of two-phase flow in a post-CHF boiling regime. Results of a numerical experiment.** Kashcheev, V.M.; Muranov, Yu.V. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Obninsk. Fiziko-Ehnergeticheskij Inst.). 1980. 11p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700329.

Droplet size effect on some characteristics of a post-CHF boiling regime of a steam-generating channel was numerically investigated according to the TM-DISCO program created on the basis of two-dimensional mathematical model. A vertical circular channel of 10 m length and 10 mm inner diameter was examined. Coolant rate $\gamma W=260$ kg/m²s, pressure P=13.7 MPa, supplied power during homogeneous energy release along the channel was equal to 11.6 kV. Calculated were the coordinate of the critical cross section and the temperature of heat transfer wall in a post CHF boiling regime, heat transfer coefficient, parameters in the critical cross section, spray flux, fields of steam temperature and drop concentration for fixed parameters in the channel and variations of the most probable size of the droplet assembly. The conclusion is made that in the calculational theoretical investigation into two-phase systems it is necessary to know as exact as possible the function of droplet distribution in sizes and the most probable radius of droplet assembly in an initial cross section as well as to use a group approach to determine all the possible characteristics.

31983 **(INIS-mf—6770) Experimental analysis of a nuclear reactor prestressed concrete pressure vessels model.** Vallin, C. (Instituto de Pesquisas Energeticas e Nucleares, Sao Paulo (Brazil)). 1980. 153p. (In Portuguese). NTIS (US Sales Only), PC A08/MF A01. Order Number DE82780243.

A comprehensible analysis was made of the performance of each set of sensors used to measure the strain and displacement of a 1/20 scale Prestressed Concrete Pressure Vessel (PCPV) model tested at the Instituto de Pesquisas Energeticas e Nucleares (IPEN). Among the three Kinds of sensors used (strain gage, displacement transducers and load cells) the displacement transducers showed the best behavior. The displacement transducers data were statistically analysed and a linear behavior of the model was observed during the first pressurizations tests. By means of a linear statistical correlation between experimental and expected theoretical data it was found that the model looses the linearity at a pressure between 110-125 atm.

31984 **(JEN—500) Version E2 from Dimco-System for the statistical calculation of components.** Moreno Gonzalez, A. (Junta de Energia Nuclear, Madrid (Spain)). 1981. 27p. (In Spanish). NTIS (US Sales Only), PC A03/MF A01. Order Number DE81701002.

A short description of the general system Dimco, together with a detailed description of E2 version are presented. E2 version is a two-dimensional finite element structural code. To illustrate the posibilities of E2 version, some results obtained with this new version are presented. These results are related with the following behaviour of the material: a) elastic, b) thermo-elastic, c) Plastic and d) creep.

31985 **(KAERI/RR—221/80) Development of fracture mechanics and related techniques for evaluation of flaws detected during inservice inspection. Part 3.** Shon, K.H.; Soh, J.Y.; Song, D.H. (Korea Advanced Energy Research Inst., Seoul (Republic of Korea)). 1981. 184p. (In Korean). NTIS (US Sales Only), PC A09/MF A01. Order Number DE82700360.

Separate abstracts are presented for each of the papers included in the data base.

31986 **Long-life fatigue of type 316 stainless steel of temperatures up to 593 C.** Jaske, C.E.; Frey, N.D. (Battelle Columbus Lab, Ohio). *American Society of Mechanical Engineers, [Paper];* No. 81-Mat-2, vp(Jun 1981).

The objective was to develop experimental data on the long-life (10/sup 5/ to 10/sup 8/ cycles to failure) fatigue resistance under strain-controlled cycling. Secondary objectives were to examine the effect of annealing and aging heat treatments on fatigue life, explore the influence of load-controlled cycling compared to strain-controlled cycling, and characterize the cyclic stress-strain behavior at low strain amplitudes. Temperatures ranged from 21 to 593/degree/C (70 to 1100/degree/F). At 427/degree/F (800/degree/F), a few experiments were performed using load-controlled cycling. 25 refs.

31987 **Electro-mechanical snubber proposal.** Anderson, R.T. (West Consult Eng, Oakland, Calif). *HTD [Publication] (American Society of Mechanical Engineers);* **55**: 47-58(1981).

The type of snubber unit proposed in this paper is electro-mechanical in nature in that it is operated by an external power supply and activation is controlled from, and the operational status is monitored in, the control room. The paper describes the operational advantages and maintenance benefits which might be realized in using an electro-mechanical (EM) type snubber and its electrical and mechanical design is examined. 9 refs.

31988 **Fluidelastic vibration of cylinder arrays in axial and cross flow--state of the art.** Paidoussis, M.P. (McGill Univ, Montreal, Que). *HTD [Publication] (American Society of Mechanical Engineers);* **52**: 11-46(1981).

A critical assessment of the state of the art for flow-induced vibrations of cylinder arrays in cross and axial flow is presented. An historical review highlights the contributions which advanced understanding of the flow-induced vibration phenomena involved and/or predictive ability. In the case of axial-flow-induced vibration, the absence of separated flow regions has contributed towards the development of analytical predictive tools. The designer may predict the onset of fluidelastic instabilities, which generally occur at very high flow velocities, with greater confidence. In contrast, in the case of cross-flow-induced vibration, the complexity of the flow has encouraged more heuristic approaches to be adopted. The state of the art in this case is discussed with the aid of a new classification of the flow-induced vibration phenomena involved, to unify and clarify the contradictory claims facing the designer. It is concluded that, although the physical understanding of cross-flow-induced vibration phenomena is not good, useful design guidelines do exist. These are capable of predicting vibration characteristics to within a factor of 2 to 10. A comprehensive bibliography is included. 115 refs.

31989 **Flow-induced vibration testing scale modeling relations.** Mulcahy, T.M. (Argonne Natl Lab, Ill). *HTD [Publication] (American Society of Mechanical Engineers);* **52**: 111-125(1981).

Similitude relationships currently employed in the design of flow induced scale model tests of nuclear reactor components are reviewed. Emphasis is given to understanding the origins of the similitude parameters as a basis for discussion of the inevitable distortions which occur in design verification testing of entire reactor systems and in feature testing of individual components made during the design process to determine whether features of the component design will create detrimental flow-induced vibration mechanisms. Distortions of similitude parameters made in current test practice are enumerated, and limitations in the use of specific distortions in model designs are evaluated based on the current understanding of flow-induced vibration mechanisms and structural response. 47 refs.

31990 **Vibration of a group of circular cylinders subjected to fluid flow.** Chen, S. (Argonne Natl Lab, Ill). *HTD [Publication] (American Society of Mechanical Engineers);* **52**: 75-88(1981).

Many structural and mechanical components consist of multiple circular cylinders, such as heat exchanger tubes and nuclear fuel bundles. These components are subjected to fluid flow. The fluid flow represents a source of energy that can induce and sustain vibration. The fluid moving with vibrating structures has an important effect on the dynamic characteristics of the structure. The objective of this paper is to review the dynamics of multiple circular cylinders in stationary fluid, parallel flow and cross flow, and to present general design guides to avoid detrimental vibration and instability. 77 refs.

2203 Fuel Elements

31991 **(FEI—1095) Synthesis of porous vortex free bodies as a hydrodynamical design problem.** Yur'ev, Yu.S.; Rogov, S.P.; Tokareva, T.I. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Obninsk. Fiziko-Ehnergeticheskij Inst.). 1980. 11p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700324.

The calculation of velocity, pressure, temperature distributions at complex coolant flow in intertube heat exchanger spaces, in rod fuel element assemblies, in backfillings is frequently performed by the porous body model. The study deals with a reverse problem-search of porous body structure, that is distribution of porosity and elements dimensions by the given flow picture. The condition of such a structure of a heterogeneous porous body at which liquid flow is vortex free in it is determined. The algorithm of solution of design reverse problem on determining the structure of a porous vortex free body has been found on which the porosity distribution law is given, the velocity field and then the porous body particles diameter is determined. As an example a flow in a diffusor with backfilling of different diameter balls is considered. This example shows the possibility of practical application of the caclulation technique.

31992 **(IAE—3275/5) Algorithm and computer code for calculating the swelling of the fuel elements with a ceramic fuel.** Kuznetsov, V.F. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Atomnoj Ehnergii). 1980. 23p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700464.

Algorithm and the OVERAT program intended for calculating the strain deformed state of a cylindrical axially symmetric fuel element with ceramic fuel and thin-walled shell are described. Calculations are performed with account for creep deformation, fuel swelling, coolant and gas pressures in the axial cavity. At each moment of time deformations and strains in the shell as well as the spatial (by rod radius) dependence of fuel swelling are calculated. Fuel swelling is determined on the basis of a theoretical model, in which gas swelling is related to formation and development only of intergrain porosity. The reactor operation at a constant power at invariable in time temperature and energy release distributions in the fuel element core rod are considered. For description of the processes taking place in a fuel element a hard system of usual differential first order equations which is solved by the Gear method has been used. The OVERAT program is written in FORTRAN and at BESM-6 computer debuged. The results of test calculations of strain-deformed state and fuel element swelling with an UO_2 hollow rod in a molybdenum shell are presented. It is pointed out that the described program in a complex with other programs can be used for investigating serviceability of various type reactors fuel elements.

31993 **(IEA-DT—148) One-group transport theory calculation for three slabs cells.** Maia, C.R.M. (Instituto de Energia Atomica, Sao Paulo (Brazil)). Feb 1979. 95p. (In Portuguese). NTIS (US Sales Only), PC A05/MF A01. Order Number DE81700997.

Thesis.

As an idealized model of plate type fuel assemblies for nuclear reactors, three-slab cells are analysed numerically based on the exact solution of the transport equation in the one-group isotropic scattering model. From the equations describing the interface conditions, a set of regular integral equations for the coefficients of the singular eigenfunctions expansions is derived using the half-range orthogonality relations of the eigenfunctions and the recently developed method of regularization. Numerical solutions are obtained by solving this set of equations iteratively. The thermal utilization factor and thermal disadvantage factors as well as flux and current distributions are reported for the first time for various sets of parameters. The accuracy of the P sub(N) approximations is also analysed compared to the exact results.

31994 **(KAERI/RR—245/80) Establishing QC/QA system in the fabrication of nuclear fuel assemblies.** Suh, K.S.; Choi, S.K.; Park, H.G.; Park, T.G.; Chung, J.S. (Korea Advanced Energy Research Inst., Seoul (Republic of Korea)). 1980. 138p. (In Korean). NTIS (US Sales Only), PC A07/MF A01. Order Number DE82700380.

Quality control instruction manuals and inspection methods for UO_2 powder and zircaloy materials as the material control, and for UO_2 pellets and nuclear fuel rods as the process control were established. And for the establishment of Q.A programme, the technical specifications of the purchased materials, the control regulation of the measuring and testing equipments, and traceability chart as a part of document control have also been provided and practically applied to the fuel fabrication process.

31995 **(KAERI/RR—247/80) Analysis for post irradiation examination: pt. 1.** Lee, B.K.; Kim, E.G.; Min, D.K.; Lee, Y.K.; Ryu, K.S. (Korea Advanced Energy Research Inst., Seoul (Republic of Korea)). 1980. 103p. (In Korean). NTIS (US Sales Only), PC A06/MF A01. Order Number DE82700432.

The purpose of post-irradiation examination facility (PIEF), which will be constructed at Daeduk Engineering Center, Korea Advanced Energy Research Institute, is to contribute to the nuclear fuel manufacturing and to the long-term nuclear energy development plan in Korea, by means of performance assurance. In order to improve the operation and management of PIEF and to carry out non-destructive test and the test assessment of nuclear fuel preparing for the completion of PIEF, this project has been performed as the first-year project of the analysis for post-irradiation examination (PIE). This work included the analysis for the specification, operation and management of PIEF, as well as the theoretical and technical surveillance for non-destructive test (NDT) techniques. The flow sheet of the post-irradiation examination is presented in Fig. 12, 13, which shows the items and sequences of non-destructive test and the waste treatment processes.

31996 **Thermal radiation properties of ThO/sub 2/ in contact with sodium and steel.** Chan, S.H.; Ma, H.H. (Univ of Wis, Milwaukee). *American Society of Mechanical Engineers, [Paper]*; No. 81-HT-66, vp(Aug 1981).

This study provides surface radiation properties of three nuclear reactor materials: thorium dioxide, sodium and steel (99 Fe+1 C). First, based on transmission spectra and Kramers-Kronig analysis, the complex refractive index, which is fundamental to surface radiation property calculations, of ThO/sub 2/ is presented over a wide spectral range. Then depending on the contacting media, three types of the surfaces are considered. They are the interfaces between ThO/sub 2/ and sodium, ThO/sub 2/ and Steel as well as ThO/sub 2/ and a gas. For each interface, the spectral interface reflectance from one side of the medium to the other side is evaluated for all wavelengths. These spectral properties are further integrated to yield the total hemispherical properties over a temperature range of interest to reactor safety analysis. 19 refs.

2204 Control Systems

REFER ALSO TO CITATION(S) 32374

31997 **(KAERI/RR—224/80) Study for standardization of nuclear power plant control panels.** Koh, B.J.; Shin, H.K.; Kim, E.S.; Shin, M.C.; Lee, S.Y. (Korea Advanced Energy Research Inst., Seoul (Republic of Korea)). 1981. 113p. (In Korean). NTIS (US Sales Only), PC A06/MF A01. Order Number DE82700381.

In order to improve the safety and reliability of the nuclear power plant, the functional and human engineering problems in a main control board were analyzed in this report. As a result of this analysis, preliminary design instruction was made and the control board was designed by considering Korean standard human body measurements. Also, the tendency of problems that we have to study for the advanced control board were suggested.

2205 Environmental Aspects

REFER ALSO TO CITATION(S) 31911, 32478

2206 Research, Test, And Experimental Reactors

REFER ALSO TO CITATION(S) 31955, 32036, 32062

31998 **(DOE/ER/10727—T1) Ohio State University Reactor Sharing Program. Semi-annual technical report, September 1, 1980-April 30, 1981.** Hajek, B.K.; Myser, R.D.; Miller, D.W. (Ohio State Univ., Columbus (USA)). 1981. Contract FG02-80ER10727. 29p. NTIS, PC A03/MF A01. Order Number DE82005334.

Nine colleges and universities have participated to the present date in the Reactor Sharing Program. Fifty-nine students supervised by twelve faculty members have performed neutron activation analysis experiments, nuclear engineering experiments, health physics laboratories, and introductions to nuclear research. Neutron activation analysis activities have been performed by students from the University of Akron, Clark Technical College, and Denison University. Nuclear engineering experiments such as approach to critical and control rod calibrations have been completed by the University of Cincinnati, Xavier University, the Air Force Institute of Technology, Miami University, and Terra Technical College. Students from Youngstown State University have performed a neutron irradiation damage study.

31999 **(FEI—1022) On-line system for study of the physical performances of the BFS critical assemblies on the M-6000 computer basis.** Bakov, A.T.; Volkov, V.A.; Milovanov, Yu.L.; Suvorov, V.D.; Telyatnikov, V.A. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Obninsk. Fiziko-Ehnergeticheskij Inst.). 1980. 11p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700463.

The block diagram algorithms and functional operation regimes of the measuring complex on the M-6000 computer basis meant for the study of physical performances of the BFS critical assemblies is considered. The algorithms developed and the programs created assure automation of experiments in three directions: a set of critical mass, reactivity measuring, investigation of temperature field dynamics. The monitoring system assuring the real time operation regime of measuring complex is described. As temperature transducers quarts resonators are used the sensitivity, of which is not worse than 0.005 deg C. A brief description of the system software: program of critical mass set (PNK), program for measuring reactivity REAK and programs for investigation on the temperature field dynamics is given as well. The programs described served as a basis for creating software for physical start up of the BH-600 reactor realized in the "Complex-Uranium" system on the M-7000 computer.

32000 **(FEI—1069) Some problems of the neutron flux increase in a fast research reactor.** Lantsov, M.N.; Minashin, M.E.; Orekhov, V.I.; Chujkov, M.I. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Obninsk. Fiziko-Ehnergeticheskij Inst.). 1980. 12p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700405.

A problem of the neutron flux increase in a fast research reactor when having restrictions in some reactor parameters has been considered. Dependences between neutron flux and thermal load of the fuel element surface, the fuel element diameter and a pitch of its arrangement in the lattice have been obtained. It is shown that restrictions ipn the reactor power and pressure drop in the core decrease considerably the growth of neutron flux when applying fuel elements of a reduced diameter. However, the reduction of a fuel element diameter to increase neutron flux is especially effective when there is not any restrictions in the reactor power. The investigations conducted show that the effect of the neutron flux increase while using the same means for enhancing power density of the core qualitatively greatly differs when there are restrictions in reactor power and coolant pressure drop in the core and when there are no such ones. These deviations in an achievabie neutron flux may become determining in the solution of an optimization task relating to the choice of a fast research reactor.

32001 **(JINR-R—10-80-826) Measuring module of spectrometer of neutron small angle scattering on the IBR pulse reactor.** Vagov, V.A.; Zhukov, G.P.; Kozlova, E.P.; Korobchenko, M.L.; Namsraj, Yu.; Ostanevich, Yu.M.; Savvateev, A.S.; Salamatin, I.M.; Sirotin, A.P. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Neutron Physics). 1980. 12p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700424.

Equipment and software for experiments with neutron small angle scattering is described. It is intended for data acquisition, equipment control storage of collected data and their output to network of the Laboratory measuring centre. The set-up equipment includes: 9 neutron detectors with corresponding electronic apparatus, sample exchanging device, communication link, SM-3 type minicomputer of an extended configuration and some units of CAMAC electronic equipment. The software (MUR applied operatio system) is intended for the automatic performance of the given number of cycles of successive uniform runs of a given duration with the sample list at two possible filter positions. Besides, the MUR system contains test, debugging and service software. The software has been designed using the SANPO system means.

32002 **(JINR-R—13-12037) Magnetic field stabilization within the 1-10 mkT range by means of cesium quantum magnetometer.** Nikitenko, Yu.V.; Roganov, A.B.; Taran, Yu.V. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Neutron Physics). 1978. 13p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700425.

A magnetic field stabilizr was developed for the installation intended for measuring the electric dipole moment of a neutron using ultracold neutrons. Mean sq.uare deviation of the magnetic field for a 100 s period should not exceed 7 pT with the IBR-2 reactor as a source. The magnetic field stabilizer is based on the quantum magnetometer with optical orientation of atoms of cesium. It operates in the 1-10 μT magnetic field. The magnetic field is created by a system of coils enclosed inside a ferromagnetic screen, screening coefficient being 200-300. The stabilization factor is 150. A stabilizer dynamic range is up to 1.5-2 nT. Magnetic field fluctuations is not more 1.5 pT in the transmission band of 1 Hz.

32003 **(JINR-R—16-80-448) International comparison of means for measurement of neutron spectra and radiation doses in the IBR-30 reactor beam.** Aleinikov, V.E.; Arkhipov, V.A.; Bamblevskii, V.P. (Joint Inst. for Nuclear Research, Dubna (USSR). Dept. of Radiation Safety). 1980. 15p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700429.

The results of comparison of responses of means for measurement neutron spectra and radiation doses in use in countries-participants of JINR in a beam of the IBR-30 pulsed fast reactor are presented. The spread of neutron and gamma radiation doses measured by different methods exceeds 30 percent - the value recommended by the ICRU to estimate sufficient accuracy for measurements of doses comparable with maximum permissible values. The reasons for inadequateness of responses of some dosimeters of most probable equivalent dose are given. In particular overstating of absorbed and equivalent neutron doses with a REM-2 recombination dosimeter, probably, results from an increased (relative to tissue-equivalent composition) hydrogen content in a gas filling the REM-2 chamber.

32004 **(ORNL/TM—7841) Bulk shielding facility quarterly report, July, August, and September 1980.** Hurt, S.S.; Lance, E.D.; Thomas, J.R. (Oak Ridge National Lab., TN (USA)). Jan 1982. Contract W-7405-ENG-26. 27p. NTIS, PC A03/MF A01. Order Number DE82006955.

The Bulk Shielding Reactor (BSR) operated at an average power level of 1919 kW for 85.74% of the time during July, August, and September. Water-quality control in both the reactor primary and secondary cooling systems was satisfactory. The Pool Critical Assembly (PCA) was operated on three occasions for the Pressure Vessel Simulator Benchmark experiment.

32005 **(ORNL/TM—7978) Bulk Shielding Facility. Quarterly report, October-December 1980.** Hurt, S.S. III; Lance, E.D.; Thomas, J.R. (Oak Ridge National Lab., TN (USA)). Jan 1982. Contract W-7405-ENG-26. 27p. NTIS, PC A03/MF A01. Order Number DE82007475.

The BSR operated at an average power level of 1927 kW for 71.02% of the time during October, November, and December. Water-quality control in both the reactor primary and secondary cooling systems was satisfactory. The PCA was used in training programs and was operated on five occasions. Nuclear engineering students from the University of Kentucky and Tennessee Valley Authority (TVA) personnel from Watts Bar Nuclear Power Plants actively participated in training laboratories. The PCA was also operated on twenty-three occasions for the Pressure Vessel Simulator Benchmark experiment.

32006 **(ORNL/TM—7979) Oak Ridge research reactor. Quarterly report, January, February, and March 1981.** Hurt, S.S. III; Lance, E.D. (Oak Ridge National Lab., TN (USA)). Jan 1982. Contract W-7405-ENG-26. 34p. NTIS, PC A03/MF A01. Order Number DE82006973.

The ORR operated at an average power level of 27.9 MW for 88.9% of the time during January, February, and March of 1981. The reactor was shut down on seventeen occasions, seven of which were unscheduled. Reactor downtime needed for refueling, maintenance, and checks was normal, with the reactor remaining available for use 92.6% of the time. Maintenance activities, both mechanical and instrument, were essentially routine in nature with the exception of one Reactor Instrumentation and Controls Design Change Memo and one Mechanical Design Change Memo. Special tests or measurements completed during this quarter are reported in a summary entitled, ORR Reactivity and Flux Comparisons between a 280 g, 45 Weight Percent Enriched Texas Instrument Fuel Element and a 265 g Standard 93 Weight Percent Enriched Texas Instrument Fuel Element.

32007 **(ORNL/TM—8029) Bulk Shielding Facility quarterly report, April, May, and June 1981.** Hurt, S.S. III; Lance, E.D.; Thomas, J.R. (Oak Ridge National Lab., TN (USA)). Jan 1982. Contract W-7405-ENG-26. 27p. NTIS, PC A03/MF A01. Order Number DE82007133.

The BSR operated at an average power level of 1825 kW for 76.75% of the time during April, May, and June. Water-quality control in both the reactor primary and secondary cooling systems was satisfactory. The BSR was operated at low and variable power during this quarter for 45 hours as part of the training programs for nuclear engineering students from Mississippi State University and the University of Tennessee. The PCA was also used in the above mentioned training programs and was operated on five occasions when nuclear engineering students from Mississippi State University and the University of Kentucky actively participated in training laboratories. The PCA was also operated on eighteen occasions for the Reactivity Measurements experiment and the Reduced Enrichment in Research and Test Reactors experiment (RERTR).

32008 **(PNE—81-150) Fission rates and ^{238}U capture rates for loading 1 of the Fast Breeder Blanket Facility.** Johnson, R.H.; Clikeman, F.M.; Chou, H.P.; Harms, G.A. (Purdue Univ., Lafayette, IN (USA). School of Nuclear Engineering). Jun 1981. Contract AS02-76ET37237. 45p. (COO—2826-15). NTIS, PC A03/MF A01. Order Number DE82004896.

Fission rate and ^{238}U capture rate measurements have been completed for the first blanket loading (FBBF-1) of the Fast Breeder Blanket Facility. Fission rates of ^{232}Th, ^{235}U, ^{237}Np, ^{238}U, and ^{239}Pu were measured using fission track recorders. A Ge(Li) counting system was used for the ^{238}U capture rate measurements; this system has been compared with a similar system in use at Argonne National Laboratory. The measurements have been closely compared with diffusion and Monte Carlo calculations. Because FBBF-1 was subcritical and driven by isotopic neutron sources, the measurements and calculations have been compared on an absolute basis.

32009 **Low level vibration effects on snubber life.** Renkey, E.J. (Westinghouse Hanford Co, Richland, Wash). *HTD [Publication] (American Society of Mechanical Engineers);* **55**: 3-11(1981).

Pipe vibration testing on the Fast Flux Test Facility (FFTF) plant has identified eleven hanger locations where vibrations are in an amplitude and frequency range that may lead to shorter seismic restraint life. This paper describes the low level vibration testing which was performed to qualify the FFTF snubbers and the results of the snubber inspections made during FFTF plant start-up. The critical range and inspection procedures instituted to identify any onset of restraint degradation, are described. 2 refs.

32010 **Structural considerations and findings from testing of nuclear components (symposium), 1981.** Severud, L.K.; Rizzo, A.J.; Kinney, C.L. (eds.). New York, NY; ASME (1981). 99p.

Proceedings includes 9 papers which emphasize the development of acceptance criteria and considerations for preparation along with test descriptions and findings associated with the structural design technology for components and piping of nuclear plants. Acceptance criteria and findings regarding thermal expansion movements of piping during startup testing of the Fast Flux Test Facility (FFTF) are considered, along with the harmonic vibration analysis of boiler circulating pumps. An update on a steam surface condenser leakage study published in 1977 is included. Eight papers are abstracted and indexed separately.

2207 Plutonium And Isotope Production Reactors

32011 **(ORNL/TM—8147) High flux isotope reactor. Quarterly report, January, February, and March 1981.** Corbett, B.L.; Poteet, K.H. (Oak Ridge National Lab., TN (USA)). Jan 1982. Contract W-7405-ENG-26. 18p. NTIS, PC A02/MF A01. Order Number DE82007134.

Routine reactor operation with four end-of-cycle shutdowns and two unscheduled shutdowns resulted in an on-stream time of 94.9% for the quarter.

32012 **(ORNL/TM—8169) High flux isotope reactor. Quarterly report, April, May, and June 1981.** Corbett, B.L.; Poteet, K.H. (Oak Ridge National Lab., TN (USA)). Jan 1982. Contract W-7405-ENG-26. 18p. NTIS, PC A02/MF A01. Order Number DE82007111.

Routine reactor operation with four end-of-cycle shutdowns resulted in an on-stream time of 92.3% for the quarter. The outer control pates were changed and a semi-annual core component inspection made.

2208 Propulsion Reactors

REFER ALSO TO CITATION(S) 32028

32013 **Nondestructive testing of steel lifting bands of the refueling machine of the nuclear ship OTTO HAHN using a special ultrasonic method.** Neumann, H.; Worschech, R. *Zeitschrift fuer Werkstofftechnik;* **12**: No. 9, 330-334(Sep 1981). (In German).

The basic overhaul and renewal of the refueling machine constructed 1965-1967 for the reactor system of the nuclear ship OTTO HAHN required among other things the replacement of the lifting hoops which are necessary for raising the fuel elements and guiding the gripping device. These steel hoops are the critical components of the refueling machine. Therefore the quality assurance of the material was particularly specified. One way of ensuring this guarantee of quality is to carry out tests involving the use of ultrasonic equipment as desired and applied here. The process is explained and its application with the results obtained is described.

2209 Reactor Safety

REFER ALSO TO CITATION(S) 31934, 31988, 31989, 31990, 32537

32014 **(DOE/ET/34030—1) High burnup PWR ramp test program. First semi-annual progress report, October 1980-March 1981.** LaVake, J.C.; Gaertner, M. (Combustion Engineering, Inc., Windsor, CT (USA); Kraftwerk Union A.G., Erlangen (Germany, F.R.)). 1981. Contract AC02-80ET34030. 29p. (CEND—395). NTIS (US Sales Only), PC A03/MF A01. Order Number DE82006121.

The overall purpose of this program, which is sponsored by DOE and conducted by Combustion Engineering and Kraftwerk Union, is to investigate the power rap behavior of PWR-type fuel under fast power ramp conditions. This will be accomplished by: (1) reporting the test results from 68 previously ramped fuel rodlets; and (2) performing twenty (20) ramp tests on rodlets having approximately 33 and 43 GWd/MTU burnup. The twenty new tests to be conducted under this program will extend the available data to higher levels of burnup than previously available. Included among these tests are rodlets having modified designs to determine if such designs improve power ramp behavior. The rodlets are first irradiated in a commercial power reactor and then ramp tested in the High Flux Reactor at Petten, Netherlands.

32015 **(DOE/NRS—82/1) Nuclear Reactor Safety: a current awareness bulletin.** (Department of Energy, Oak Ridge, TN (USA). Technical Information Center). 15 Jan 1982. 8p. NTIS, PC A02/MF A01. Order Number DE82006750.

Current citations added to the Energy Data Base in the category Reactor Safety are presented. Reports are listed in report number order, and non-report literature is listed in reverse chronological order. These summaries and all citations to information on reactor safety back to January 1967 are available for on-line searching and retrieval using the DOE/RECON system. Citations from June 1976 to the present are available on the Energy Data Base, which may also be searched using the commercial on-line retrieval systems.

32016 **(EGG-M—02381) Holographic investigation of nonequilibrium vapor generation in a two-dimensional nozzle.** Fincke, J.R.; Deason, V.A. (EG and G Idaho, Inc., Idaho Falls (USA)). 1981. Contract AC07-76ID01570. 9p. NTIS, PC A02/MF A01. Order Number DE82005645.

The choking process in short nozzles with subcooled upstream conditions is dominated by nonequilibrium vapor generation. Pulsed holography was used to obtain detailed three-dimensional images of the phase change process in a two-dimensional converging-diverging nozzle. The flow pattern consists of a central liquid jet, surrounded by vapor, extending into the diffuser. In the near-throat region, vapor generation is confined to the vapor-jet interface and is limited by the turbulent transport of thermal energy in the jet. The vapor generation rate and jet hydrodynamics in this region control the critical mass flux. For some flow conditions, rapidly growing vapor bubbles begin to appear well downstream of the throat region. The explosive growth of these bubbles eventually breaks up the liquid jet, and thus influences the pressure recovery process.

32017 **(EPRI-NP—526-Vol.4,Pt.2) Transient deformation properties of Zircaloy for LOCA simulation. Final report.** Hann, C.R.; Mohr, C.L.; Busness, K.M.; Olson, N.J.; Reich, F.R.; Stewart, K.B. (Pacific Northwest Lab., Richland, WA (USA)). May 1980. Contract AC06-76RL01830. 623p. NTIS, PC A99/MF A01. Order Number DE82005498.

Portions of document are illegible.

This experimental data report is Volume 4 of a series of 5 volumes describing the oxidation and deformation rate behavior of Zircaloy cladding under simulated LOCA conditions. It contains listings of strain versus stress, time, and temperature evaluated from the numerical constitutive relationships and the original data used to develop them. This volume also contains listings of the ramp load, pressure, and temperature test data from both current and previous phases of the series, as well as material describing applications of the data.

32018 **(GA-A—16467) Safety/licensing assessment of the 1170-MW(t) HTGR process heat plant.** Lewis, J.H.; Wise, R.K. (General Atomic Co., San Diego, CA (USA)). Sep 1981. Contract AT03-76SF70046. 99p. NTIS, PC A05/MF A01. Order Number DE82007497.

This report discusses safety and licensing considerations for a process heat (PH) application of the high-temperature gas-cooled reactor (HTGR). The design is based on an 1170-MW(t) nuclear heat source (NHS) that produces a nominal 516 kg/s (4.1 x 10^6 lb/h) of helium at 793°C (1460°F) and 4.9 MPa (709 psia). This report describes inherent and engineered features that contribute to HTGR safety. It reviews the principal safety/licensing regulatory criteria and a number of issues that require data development or research activities. This report presents a radiological safety assessment of an indirect-cycle (i.e., employs an intermediate heat exchanger) HTGR-PH plant for normal operations and accidents. Design features and design criteria ensure maintenance of low risk to plant operators and the public and small releases of radioactivity to the environment. This report discusses accidents in terms of the conventional, conservative analyses required in safety analysis reports and from the standpoint of probabilistic risk assessment.

32019 (GKSS—81/E/27, pp I 3-21) **State of pressure suppression containment research in the Federal Republic of Germany.** Karwat, H. 1981. NTIS (US Sales Only), PC A11/MF A01.

From 1. international specialists meeting on BWR-pressure suppression containment technology; Geesthacht, F.R. Germany (1 Jun 1981).

Within the frame of the research project 'containment under LOCA conditions' sponsored by the Federal Ministry for Research and Technology several experimental and analytical activities have been initiated and performed during the last 5 years to study basic phenomena associated with the condensation of steam in Pressure Suppression Containment Systems. Main aim of these activities is to obtain a full understanding of processes like pool swell, water fall back, condensation oscillations, condensation chugs, which determine global or local loadings on the vent pipe system and the containment structures. Experimental efforts have been performed by GKM-KWU and GKSS while analytical work was carried out by several institutions (GRS, KfK, SDK, GKSS, TU-Berlin).

32020 (GKSS—81/E/27, pp I 23-42) **State of JAERI Full-Scale Mark II CRT Program.** Kukita, Y.; Namatame, K.; Takeshita, I.; Shiba, M. 1981. NTIS (US Sales Only), PC A11/MF A01.

From 1. international specialists meeting on BWR-pressure suppression containment technology; Geesthacht, F.R. Germany (1 Jun 1981).

The purpose of the paper is to provide an overview of the Full-Scale Mark II CRT (Containment Response Test) Program which is currently ongoing at the Japan Atomic Energy Research Institute (JAERI) for testing of the LOCA hydrodynamic loads induced in the General Electric BWR Mark II containment system. The latest outputs from the data analyses are discussed with emphasis placed on the so-called multivent effects on the steam condensation loads.

32021 (GKSS—81/E/27, pp I 43-79) **Mark III Confirmation Test Program.** McIntyre, T.R. 1981. NTIS (US Sales Only), PC A11/MF A01.

From 1. international specialists meeting on BWR-pressure suppression containment technology; Geesthacht, F.R. Germany (1 Jun 1981).

The Mark III Confirmatory Test Program developed an experimental data base for the Mark III pressure suppression containment design. This paper gives an overview of this test program. Included are the test facility design and scaling, as well as major experimental findings on drywell and wetwell pressurization, vent clearing, pool swell, pool swell impact, and condensation induced loads.

32022 (GKSS—81/E/27, pp I 81-125) **Review of GKSS 3-vent experimental program and results.** Aust, E.; Sakkal, F. 1981. NTIS (US Sales Only), PC A11/MF A01.

From 1. international specialists meeting on BWR-pressure suppression containment technology; Geesthacht, F.R. Germany (1 Jun 1981).

Fifteen multivent steam experiments have been completed. Experimental data indicate, that: increasing mass flow rate into the system causes nearly the same system pressure level but different time periods for condensation oscillation (C.O.) and chugging stage, especially a long chugging period under low steam mass rates; increasing pool start temperature reduces pressure amplitudes especially during chugging in a hot pool with 60°C start temperature; decreasing pool back pressure causes a lower system pressure level and increasing pressure amplitudes, especially during CO and chugging by 1 bar; complete global replication of test behaviour was only found in experiments with the same pool back pressure of 1 bar and also in experiments with a higher system pressure but only for special time regimes; chugging nature indicates two pulses, a first pulse induced by a steam collapse outside the vent pipe exit with an oscillation of the vent acoustic frequency and a second subsequent pulse caused by a steam torus collapse inside the vent pipe exit, which excites an attenuating frequency obviously controlled by the natural frequency of the wet well pool-structure-system, sometimes the proceeding pulse with vent pipe acoustic frequency is missed; time interval for synchronous chugging at the 3 vent pipe exits is in the range of 50 to 100 ms.

32023 (GKSS—81/E/27, pp II 3-24) **Multi-vent system problems.** Class, G. 1981. NTIS (US Sales Only), PC A11/MF A01.

From 1. international specialists meeting on BWR-pressure suppression containment technology; Geesthacht, F.R. Germany (1 Jun 1981).

The paper deals with chugging in the pressure suppression system (PSS) of BWRs. On the basis of experimental and theoretical investigations performed so far, aspects of the problem are presented, which can be considered as solved or not solved. The description of the PSS is based on single cell experiments. Afterwards multivent system behavior are discussed. The analysis of the PSS calls for individual models (KONDAS, SYNCHRO) simulating the drywell, the vent pipe, steam-water interface behavior including condensation, and the water pool (including fluid structure interaction, if necessary).

32024 (GKSS—81/E/27, pp II 25-34) **Multi-vent effects on the dynamic pressure caused by chugging.** Arinobu, M.; Suzuki, I. 1981. NTIS (US Sales Only), PC A11/MF A01.

From 1. international specialists meeting on BWR-pressure suppression containment technology; Geesthacht, F.R. Germany (1 Jun 1981).

In order to investigate multi-vent effects, the dynamic pressure caused by chugging have been simulated in multi-vent systems representing Mark-II pressure suppression pools, using analysis code 'ACERON'. In this analysis code, the dynamic phenomena caused by steam condensation at the vent pipe exits are assumed to be governed by wave equations, while steam bubbles are approximated by simple sources which can produce pressure waves in the pool as well as in the vent pipes. The multi-vent effects have been investigated especially related to the equivalent single vent system, and classified as follows: (1) configuration effect, (2) phasing and magnitude effects. The former is related to space and the latter to time and space. The configuration effect has been discussed based on the calculation results for single vent, 3 vent and 7 vent systems, while the phasing and magnitude effects have been investigated mainly for a 3 vent system.

32025 (GKSS—81/E/27, pp II 35-48) **Analysis of pressure oscillations and pressure spikes in the Marviken pressure suppression containment.** Collen, J.; Johansson, A. 1981. NTIS (US Sales Only), PC A11/MF A01.

From 1. international specialists meeting on BWR-pressure suppression containment technology; Geesthacht, F.R. Germany (1 Jun 1981).

A brief description is given of the theoretical investigations carried out within the MARTIN-III project, which is the third in a series of projects involving evaluation of data from the full scale containment response tests at the Marviken power station. The experimental data collected in these blowdown tests, which were completed in 1976, provide information about the pressure oscillations and pressure spikes induced in the pressure-suppression containment by instabilities in the steam condensation during blowdown. Two geometries were investigated, the Marviken containment and a typical BWR containment of Swedish design.

32026 (GKSS—81/E/27, pp II 49-58) **Analysis of fluid-structure interaction in pressure suppression systems type 69 during steam condensation.** Krieg, R. 1981. NTIS (US Sales Only), PC A11/MF A01.

From 1. international specialists meeting on BWR-pressure suppression containment technology; Geesthacht, F.R. Germany (1 Jun 1981).

The oscillations of German pressure suppression systems type 69 are investigated where the condensation chamber is located inside the spherical containment. Therefore, the pressure transients and oscillations affect directly the containment structure. The calculations show that consideration of the fluid inertia of the water pool reduces the eigenfrequencies significantly and increases the transient pressure loading. Without fluid inertia the smallest shell eigenfrequency is about 50 Hz. Including fluid inertia the smallest eigenfrequency is now in the order of 10 Hz, but the maximum pressure loading is about 40% higher than before. Strong stress gradients occur in the spherical containment close to the intersection with the bottom of the water pool. Therefore, high spatial resolution is required. Final results are presented in terms of admissible steam condensation scenarios where the stress reach their allowed upper limit. If these admissible scenarios cover all steam condensation events which may occur, the dimensions of the containment shell are adequate to blowdown loading. In this way the complex physics of steam condensation which has a certain statistic character and requires extensive experimental investigations is clearly distinguished from the fluid-structure interaction and shell dynamics problem which can be investigated on a mathematical basis.

32027 (GKSS—81/E/27, pp II 59-82) **Recent research at MIT on fluid-structure interactions, chugging, and scaling laws for SRV discharges.** Sonin, A.A. 1981. NTIS (US Sales Only), PC A11/MF A01.

From 1. international specialists meeting on BWR-pressure suppression containment technology; Geesthacht, F.R. Germany (1 Jun 1981).

Research is under way at MIT in three areas directly related to BWR pressure suppression containment technology: (1) an investigation of the 'perturbation' method for dealing with fluid-structure interactions in containment-type systems, (2) a fundamental investigation of the interfacial condensation rate mechanism during chugging, and (3) an investigation of the scaling laws for small-scale experimental simulation of various types of safety-relief valve discharges in containment systems.

32028 (GKSS—81/E/27, pp II 83-103) **Modal analysis of the GKSS-PSS-wet well.** Kolb, M.; Boettcher, G. 1981. NTIS (US Sales Only), PC A11/MF A01.

From 1. international specialists meeting on BWR-pressure suppression containment technology; Geesthacht, F.R. Germany (1 Jun 1981).

The so-called modal analysis of a structure characterizes its vibration modes by resonant frequency, damping, and shape vector. The GKSS PSS test facility utilizes a wetwell that simulates a full-scale quarter-sector of a marine reactor pressure suppression system. Its complicated geometry practically prohibits a theoretical modal analysis. Signals of strain gages and accelerometers attached to the wetwell's walls as well as signals of pressure sensors in the pool showed distinct periodities during the blow-down regimes of condensation oscillation and especially of chugging. Frequency analyses of the signals revealed corresponding peaks in the auto-spectra and appreciable coherence in some frequency bands. An experimental modal analysis of the vertical wetwell walls with different pool water levels was undertaken in order to connect the aforementioned peaks with structural resonances and possible fluid/structure interaction resonances. Most wetwell modes identified by hammer blow excitation of a wall and roving accelerometers correspond in frequency to vibrations observed during blow-down. The lowest mode was found at about 40 Hz only for the water-filled wetwell, a similar frequency had occured at about 36 Hz prominently in blow-down and had displayed the highest coherence be-

tween pool pressure and structural movements. In order to explain the phenomena observed at 36/40 Hz acoustic modes were considered. However, for bubblefree room temperature water the frequency of the very lowest acoustic mode (1st vertical) occurs from calculation only at about 100 Hz.

32029 **(JAERI-M—9359) LFTPLT8: plotter program for RELAP5 code.** Yamano, K.; Abe, N.; Tasaka, K. (Japan Atomic Energy Research Inst., Tokyo). Feb 1981. 33p. (In Japanese). NTIS (US Sales Only), PC A03/MF A01. Order Number DE82700474.

The plotter program LFTPLT8 is a new version of the LFTPLT7 developed to plot the calculated results by RELAP5 code. The RELAP5/MOD0 code has also been revised for LFTPLT8. LFTPLT8 is capable of multiple plotting of any combination of experimental data and calculated results by RELAP4J, RELAP4/MOD5, ALARM-P1, and RELAP5/MOD0.

32030 **(JAERI-M—9403) Full-Scale Mark II CRT program data report No. 10 (TEST 1203).** Kukita, Y.; Takeshita, I.; Yamamoto, N.; Namatame, K.; Shiba, M. (Japan Atomic Energy Research Inst., Tokyo). Mar 1981. 126p. (In Japanese). NTIS (US Sales Only), PC A07/MF A01. Order Number DE82700382.

Recorded data for TEST 1203 conducted on the Full-Scale Mark II CRT (Containment Response Test) Facility are presented. The test 1203 is the third test run of a series of steam discharge pool swell test. It is one of the tests where break diameter was varied parametrically, i.e., TEST 1201 (200 mm), TEST 1202 (240 mm) and TEST 1203 (220 mm). The test was successfully conducted. A drywell initial pressurization rate of 188 kPa/s was obtained, which is approximately equal to what is postulated for a hypothetical DBA (Design Basis Accident) LOCA in the BWR Mark II containment.

32031 **(JAERI-M—9404) Full-Scale Mark II CRT program data report No. 11 (TEST 1204).** Kukita, Y.; Takeshita, I.; Yamamoto, N.; Namatame, K.; Shiba, M. (Japan Atomic Energy Research Inst., Tokyo). Mar 1981. 125p. (In Japanese). NTIS (US Sales Only), PC A06/MF A01. Order Number DE82700383.

Recorded data for TEST 1204 conducted on the Full-Scale Mark II CRT (Containment Response Test) Facility are presented. The TEST 1204 is the fourth test run of a series of steam discharge pool swell tests. The test conditions are similar to those of the TEST 1203 except for lower initial pool temperature. The test was successful and the maximum level of pool surface was fairly lower than in the TEST 1203 due to the lower pool temperature.

32032 **(KAERI/RR—231/80) Experimental study of safety injection and reflooding.** Lee, Y.W.; Chung, M.K.; Lee, S.H.; Kim, J.J.; Yu, M.W.; Won, S.Y. (Korea Advanced Energy Research Inst., Seoul (Republic of Korea)). 1981. 101p. (In Korean). NTIS (US Sales Only), PC A06/MF A01. Order Number DE82700373.

Five rod bundle experiments in vertical and horizontal flow channel were carried out to investigate the reflood characteristics of rod bundle. It was found that the rewetting phenomena are largely affected by flow patterns, local variation of flow area, location of fuel rod and attachment of spacers. Specially in horizontal channel it was observed that the fuel rods were deformed due to the thermal stress caused by flow stratification. In a rod-in-annulus reflood test, the precursory cooling length which is dependent upon the thermal-hydraulic features of two-phase mixture, increases in early reflood stage, but becomes constant at a certain point, where it forms a fully developed precursory cooling length.

32033 **(SAND—80-2627) Modeling turbine-missile impacts using the HONDO finite-element code.** Schuler, K.W. (Sandia National Labs., Albuquerque, NM (USA)). Nov 1981. Contract AC04-76DP00789. 56p. NTIS, PC A04/MF A01. Order Number DE82006875.

Calculations have been performed using the dynamic finite element code HONDO to simulate a full scale rocket sled test. In the test a rocket sled was used to launch at a velocity of 150 m/s (490 ft/s), a 1527 kg (3366 lb) fragment of a steam turbine rotor disk into a structure which was a simplified model of a steam turbine casing. In the calculations the material behavior of and boundary conditions on the target structure were varied to assess its energy absorbing characteristics. Comparisons are made between the calculations and observations of missile velocity and strain histories of various points of the target structure.

32034 **Sodium-water reaction testing in support of LMFBR steam generator development.** Neely, H.H.; Tessier, M.J. (Rockwell Int, Canoga Park, Calif). *American Society of Mechanical Engineers, [Paper];* No. 81-JPGC-NE-3, vp(Oct 1981).

This paper briefly describes the Large Leak Test Rig after its conversion for the second series program to test internals typical of the Clinch River Breeder Reactor steam generator. The test article instrumentation provided and the data gathered are described. An explanation of the phenomena observed is discussed. The Series II tests are dedicated to investigating intermediate-to-large sodium-water reaction (SWR) and nonreactive events (nitrogen-sodium). The first two tests were double-ended guillotine (DEG) nonreactive tests utilizing single and double rupture disks for sodium containment to investigate pure hydraulic effects. The third test was locatd in about the same location as the other two and was a SWR DEG test. 9 refs.

32035 **Method of analysis of CRBRP transients for the steam generator.** von Arx, A.V. (Rockwell Int, Canoga Park, Calif). *American Society of Mechanical Engineers, [Paper];* No. 81-JPGC-NE-5, vp(Oct 1981).

In a nuclear power plant such as the Clinch River Breeder Reactor Plant, there is a large number of transients which have to be analyzed. The analysis is required to demonstrate the structural integrity of the various components. The task of analyzing each of these events for the several zones that are required to be evaluated becomes a very costly operation in terms of manpower and computer usage. A method has been developed to select only a few representative transients which are defined as umbrella transients. This approach reduces the number of events to be analyzed on a given component, such as the steam generator, from over one hundred to less than ten and has proven to be cost effective. 5 refs.

32036 **Operational safety at the FFTF.** Baird, Q.L.; Hagan, J.W.; Seeman, S.E.; Baker, S.M. (Westinghouse Hanford Co, Richland, Wash). *American Society of Mechanical Engineers, [Paper];* No. 81-JPGC-NE-6, vp(Oct 1981).

An extensive operational nuclear safety program has been an integral part of the design, startup, and initial operating phases of the Fast Flux Test Facility (FFTF). During the design and construction of the facility, a program of independent safety overviews and analyses assured the provision of responsible safety margins within the plant, protective systems, and engineered safety features for protection of the public, operating staff, and the facility. The program is continuing through surveillance of operations to verify continued adherence to the established operating envelope and for timely identification of any trends potentially adverse to those margins.

32037 **Direct reactor auxiliary cooling system for the 1000-MWE LMFBR developmental plant.** Brunings, J.E.; Hartung, J.R.; Mills, J.C.; Moody, E. (Rockwell Int, Canoga Park, Calif). *American Society of Mechanical Engineers, [Paper];* No. 81-JPGC-NE-7, vp(Oct 1981).

The 1000-MWe LMFBR developmental plant design was prepared during 1978-1981. This paper provides a description and discusses the safety-related features of the direct reactor auxiliary cooling system proposed for the developmental plant. 2 refs.

32038 **Development of a self-actuated shutdown system.** Tupper, R.B.; Brummond, W.A.; Paschall, R.K.; Borys, S.S. (Westinghouse Electr Corp, Madison, Pa). *American Society of Mechanical Engineers, [Paper];* No. 81-JPGC-NE-8, vp(Oct 1981).

The intent of the program to develop a self-actuated shutdown system for LMFBRs is to assure reactor shutdown can be accomplished without the primary plant protection system. The

mechanisms being developed will respond to accident conditions in the reactor and will inherently release a neutron absorber to shut down the plant without the aid of an externally supplied signal. One shutdown system consists of a rodded absorber assembly supported by a temperature-sensitive electromagnet. Another system uses a thermionic switch in conjunction with an electromagnet. The thermionic switch is located where abnormal fuel coolant temperatures will open the circuit and interrupt power to the electromagnet.

32039 **Heat exchanger applications during TMI-2 post accident cooldown.** Patti, F.J.; Dam, A.S.; Hess, C.W. (Burns and Roe Inc, Woodbury, NY). *American Society of Mechanical Engineers, [Paper];* No. 81-JPGC-NE-9, vp(Oct 1981).

The Decay Heat Removal System was not used to remove decay heat following the accident at Three Mile Island Unit 2. Instead, other systems were utilized. Further, additional systems were designed to provide supplementary post-accident heat removal capability. Still other backup systems were designed, but not installed. This paper discusses post-accident cooldown, as well as means taken to provide backup cooling capability. The TMI-2 post-accident experience clearly demonstrates the wide range of options available for removing decay heat.

32040 **Primary loop heat exchanger for HTGR plant residual heat removal and auxiliary cooling system.** Hurn, E.J.; Carosella, D.P. (Gen At Co, San Diego, Calif). *American Society of Mechanical Engineers, [Paper];* No. 81-JPGC-NE-10, vp(Oct 1981).

Design studies have been under way on high-temperature process heat and steam applications utilizing a high-temperature gas-cooled reactor plant. Plant designs have incorporated safety-class core auxiliary cooling systems (CACSs). These systems differ from comparable light water reactor systems in that they are additional to, and separate from, the reactor main coolant loops. The CACS, therefore, provides an independent means of cooling the reactor core and is designed to maintain the prestressed concrete reactor vessel, core, and component temperatures within safe limits. Each CACS primary loop includes an auxiliary helium circulator, shutoff valve, and water-cooled core auxiliary heat exchanger (CAHE). This paper addresses the design criteria, design configuration, performance, and safety aspects of the CAHE design. 1 ref.

32041 **Operational safety and reliability research at EBR-II.** Lambert, J.D.B.; Singer, R.M.; Strain, R.V.; Hofman, G.L.; Mohr, D.; Seidel, B.R.; Sackett, J.I.; Fryer, R.M. (Argonne Natl Lab, Ill). *American Society of Mechanical Engineers, [Paper];* No. 81-JPGC-NR-11, vp(Oct 1981).

Present research into operational safety and reliability at EBR-II comprises tests of breached fuel pins under normal reactor conditions, and tests that investigate the ability of an LMFBR to reject decay heat by natural convection. The reactor is now being prepared for mild transient testing of both intact and breached pins; to investigate local faults in subassemblies; and to study more fully the rejection of decay heat under conditions more severe than those already examined. Initial data on the behavior of the EBR-II driver-fuel pins indicate that they will withstand the mild overpower transients contemplated for the fuels testing. 11 refs.

32042 **Safety in nuclear engineering by means of nondestructive testing.** Zillmann, J. *Materialpruefung;* **23**: No. 9, 313-315(Sep 1981). (In German).

From 4. international conference on nondestructive evaluation in nuclear industry; Lindau, Germany, F.R. (25 - 27 May 1981).

Report on the 4th International Meeting on Nondestructive Testing in Nuclear Engineering, which in 1981 was held for the first time in the Federal Republic of Germany.

32043 **Best estimate radiation heat transfer model developed for TRAN-BD1.** Spore, J.W.; Giles, M.M.; Shumway, R.W. (Edgerton, Germeshausen and Grier, Inc, Idaho Falls, Idaho). *American Society of Mechanical Engineers, [Paper];* No. 81-HT-68, vp(Aug 1981).

A best estimate radiation heat transfer model for analysis of BWR fuel bundles has been developed and compared with 8*8 fuel bundle data. The model includes surface-to-surface and surface-to-two-phase fluid radiation heat transfer. A simple method of correcting for anisotropic reflection effects has been included in the model. 9 refs.

32044 **Radiative heat transfer to high pressure steam.** Reyes, J.N. Jr. (US Nucl Regul Comm, Washington, DC). *American Society of Mechanical Engineers, [Paper];* No. 81-HT-69, vp(Aug 1981).

Experiments that examine the effectiveness of cooling nuclear reactor fuel bundles with high-pressure steam have been performed at the Oak Ridge National Laboratory (ORNL). The bundle uncovery tests have been used to determine the fuel pin surface temperatures during steady-state steam cooling. Using these temperature profiles, a sectored-pin model has been used to calculate the quantity of radiative heat absorbed by the steam, the shroud walls, and the water rods. Using a simplified version of this model, which may be better suited for thermal-hydraulic codes, average radiative heat transfer coefficients for the ORNL bundle have been calculated. 10 refs.

32045 **Nonequilibrium vapor generation model for flashing flows.** Saha, P.; Abuaf, N.; Wu, B.J.C. *American Society of Mechanical Engineers, [Paper];* No. 81-HT-84, vp(Aug 1981).

A nonequilibrium vapor generation model for flashing flows is presented. The model consists of a flashing inception point, a bubbly flow regime followed by a bubbly-slug regime, an annular or annular-mist regime, and finally a dispersed-droplet regime. Existence of superheated liquid at the inception point and beyond is recognized. The vapor generation rate in each flow regime is calculated from the estimates for interfacial area density and net interfacial heat flux. However, the bubble number density at the flashing inception point was varied to obtain optimum fits with the void fraction data taken in a vertical converging-diverging nozzle. 32 refs.

32046 **Monitoring of nuclear power plant reactor vessel thermal transients and fatigue usage factors.** Nadeau, L.J. (Northeast Util Serv Co, Hartford, Conn). *American Society of Mechanical Engineers, [Paper];* No. 81-PVP-12, vp(Jun 1981).

This paper presents general overviews of plant specific procedures used at operating nuclear power plants for the tracking of thermal transients. Outlines of analytical techniques incorporated in the design phase to evaluate reactor vessel components for thermal fatigue are discussed. Areas where conservatisms exist in the analysis and a presentation of procedures available for on-line monitoring of critical operational parameters which affect the design basis are addressed. 2 refs.

32047 **Qualification of induction heating stress improvement for mitigation of stress corrosion cracking.** Hughes, N.R.; Diaz, T.P.; Pestanas, V.V. (GE, San Jose, Calif). *American Society of Mechanical Engineers, [Paper];* No. 81-PVP-13, vp(Jun 1981).

This paper describes the qualification of induction heating stress improvement (IHSI) for mitigation of intergranular stress, corrosion cracking (IGSCC) in Boiling Water Reactor (BWR) piping. The IHSI process, which is applied to piping after it is fully erected, produces compressive residual stresses on the pipe inside surface in the vicinity of the weld heat affected zone. 6 refs.

32048 **Evaluation of dynamic load combination fatigue damage.** Ibrahim, Z.N.; Gibraiel, S.A. (Sargent and Lundy Eng, Chicago, Ill). *American Society of Mechanical Engineers, [Paper];* No. 81-PVP-20, vp(Jun 1981).

Nuclear power plant piping systems are subjected to a wide range of anticipated and postulated dynamic occurrences. The piping response to each of these occurrences exhibits a finite number of variable amplitude strain reversals which could fatigue its pressure boundary. The occurrence equivalent number of fatigue damaging cycles was determined by counting the response amplitude reversals of a single degree of freedom model. 11 refs.

32049 Comparison of LMFBR piping response obtained using response spectra and time history methods. Hulbert, G. (Westinghouse Electr Corp, Madison, Pa). *American Society of Mechanical Engineers, [Paper];* No. 81-PVP-28, vp(Jun 1981).

The dynamic response to a seismic event is calculated for a piping system using a response spectrum analysis method and two time history analysis methods. The results from the analytical methods are compared to identify causes for the differences between the sets of analytical results. Comparative methods are also presented which help to gain confidence in the accuracy of the analytical methods in predicting piping system structural response during seismic events. 7 refs.

32050 3-D finite element analysis for the investigation of feedwater line cracking in PWR steam generators. Thurman, A.L.; Mahlab, M.S.; Boylstein, R.E. (Westinghouse Electr Corp, Pittsburgh, Pa). *American Society of Mechanical Engineers, [Paper];* No. 81-PVP-3, vp(Jun 1981).

In mid-1979 cracking was discovered in one of the feedwater lines of an operating PWR system. This paper presents the results of the 3-D stress analysis performed to determine the contribution of thermally stratified flow conditions to the feedwater line cracking. Excessive fatigue damages are predicted at locations which correlate well with the observed cracks. Thus thermal stratification is a prime contributor to the observed feedwater line cracking. 6 refs.

32051 Lessons from major accidents. Laxenburg, Austria; International Institute for Applied Systems Analysis (1981). 36p. (IIASA-ER—6). Office of Communications, IIASA, A-2361, Laxenburg, Austria.

This Executive Report draws on the Fischer paper to make comparisons of two large-scale accidents that have occurred in recent times - the oil blowout in the North Sea in the spring of 1977 (Bravo), and the nuclear reactor accident at Three Mile Island, Pennsylvania, USA, in the spring of 1979 (TMI). The remarkable similarity of these two unrelated events in different technological fields provides a rare and perhaps unique opportunity to identify some key organizational issues of accident prevention and accident management. Fischer has capitalized on this opportunity by briefly describing and comparing the organizations involved and by exploring some of the organizational issues thus raised. As a basis for discussion and comparison of major accidents, six types of actors (individuals or agencies) involved in the events of Bravo and TMI are identified; they would be present in any large-scale accident involving the production of resources. How these actors came to play their roles at Bravo and at TMI, and how roles - and even responsibilities - changed during the crucial periods of both accidents are analyzed.

32052 Interactive fluid-structural dynamic problems in power engineering, presented at the joint conference of the pressure vessels and piping, materials, nuclear engineering, solar energy divisions, 1981. Au-Yang, M.K.; Moody, F.J. (eds.). New York, NY; ASME (1981). 177p. (CONF-810625—).

From ASME PVP conference; Denver, CO, USA (21 Jun 1981).

Proceedings includes 11 papers, in which emphasis has been placed on understanding the physics of coupled fluid-structure systems commonly encountered in the power generation industry and on clarifying the different methods of solving the problem. Papers that solve specific problems are included mainly as illustrative examples. Topics considered include: nuclear reactors and power plants and their safeguard systems; liquid storage tanks; vapor quench systems; steam generators; and seismic wave effects. Seven papers are abstracted and indexed separately.

32053 Size effect related to damping caused by water submersion. Dong, R.G. (Lawrence Livermore Lab, Calif). *HTD [Publication] (American Society of Mechanical Engineers);* **46**: 19-30(1981). (CONF-810625—).

From ASME PVP conference; Denver, CO, USA (21 Jun 1981).

An important effect of water submersion on the dynamic response of a structure is the increase in effective damping. The dynamic response of submerged structures is of interest in the nuclear power industry for reasons of operational safety during seismic and other dynamic excitations. In this paper, the added damping contribution that results from the viscosity of water and the dependence of the contribution on structural size are examined. Other factors considered are the applicable range of viscous damping with respect to displacement amplitude and how far neighboring members must be from each other to respond as if in open water. An expression is derived for relating the damping value to structural size. Estimated added-damping values for representative fuel elements, fuel bundles, and main steam-pressure-relief-valve lines are given. 17 refs.

32054 Method for coupled three-dimensional analysis of reactor vessel blowdowns with internal structures. Silling, S.A.; Gross, M.B.; Santee, G.E. Jr.; Chang, F.H. (Sci Appl Inc, San Leandro, Calif). *HTD [Publication] (American Society of Mechanical Engineers);* **46**: 31-45(1981). (CONF-810625—).

From ASME PVP conference; Denver, CO, USA (21 Jun 1981).

The STEALTH 3D and WHAMSE 3D computer codes have been combined to perform three-dimensional coupled fluid/structure calculations of the blowdown response of a pressure vessel with internal structures typical of a pressurized water reactor. The fluid/structure coupling, which is performed cycle by cycle during a calculation, is described. The coupled fluid/structure code, STEALTH/WHAMSE 3D, has been used to simulate the decompression of test V31.1 from the HDR blowdown test series. Calculations of fluid pressure, differential fluid pressure and hoop strain compare favorably with the experimental data from test V31.1. The computed peak axial stain compares less favorably with the experimental data, probably due to coarseness of the structural grid. 14 refs.

32055 Analysis of HDR blowdown experiment for fluid-structure interactions. Takeuchi, K. (Westinghouse Electr Corp, Pittsburgh, Pa). *HTD [Publication] (American Society of Mechanical Engineers);* **46**: 71-88(1981). (CONF-810625—).

From ASME PVP conference; Denver, CO, USA (21 Jun 1981).

The HDR experimental facility, comprised of a full-scale pressure vessel, core barrel, and piping systems is described. In the blowdown experiment, V31.1, the fluid-structure interaction of the core barrel and downcomer water is significant. This experiment is analyzed to assess the MULTIFLEX code. The HDR downcomer annulus is modeled by the one-dimensional network that is equivalent to two-dimensional fluid-structure interactions. The core barrel is modeled by the projector method for combined beam and shell models. The vessel motion is taken into account by means of the relative modal analysis proposed in this paper. Computed time histories of pressure, pressure differentials, and barrel wall displacements are compared with experimental data. Agreement between experiment and post-test computation is found. 11 refs.

32056 Evaluation of incompressible hydrodynamic mass methods in reactor applications. Takeuchi, K. (Westinghouse Electr Corp, Pittsburgh, Pa). *HTD [Publication] (American Society of Mechanical Engineers);* **46**: 89-103(1981). (CONF-810625—).

From ASME PVP conference; Denver, CO, USA (21 Jun 1981).

The hydrodynamic (or virtual) mass approach is evaluated by comparison of structural responses computed by the hydrodynamic mass method with those computed by MULTIFLEX code for a fluid/structure interaction problem with fluid compression effects taken into account. A sample problem used in that evaluation is a simplified 1-D PWR model which is first subjected to a LOCA type transient. The time history of structural displacement computed with the hydrodynamic mass approach is compared with MULTIFLEX results. The frequencies of structural oscillation of these two computations agree. The amplitudes disagree by more than 50%, which is attributed to the effect of fluid compressibility. For the seismic study, sinusoidal forces are applied to the floor at the vessel support. The system responses are expressed by the response

functions or the maximum values of the barrel/vessel relative displacements as the applied frequency is varied. The response functions are computed by the hydrodynamic mass method and by MULTIFLEX for evaluation of the virtual mass method. For the pump pulsation study, sinusoidal pressure oscillations are applied at the pump outlet and the response functions are computed as above. 12 refs.

32057 **Virtual mass calculation for loss-of-coolant-accident analysis of a pressurized water reactor.** Bogard, W.T. (Westinghouse Electr Corp, Pittsburgh, Pa). *HTD* [*Publication*] *(American Society of Mechanical Engineers);* **46**: 119-130(1981). (CONF-810625—).

From ASME PVP conference; Denver, CO, USA (21 Jun 1981).

The presence of the fluid inside a pressurized water reactor will influence the dynamic motion of the reactor internal structures. To determine the structural integrity of these structures in the event of a loss-of-coolant-accident (LOCA), dynamic analyses must include the interaction of the hydraulic and structural systems. The classical method is to represent the hydraulic system by a virtual mass approach in structural models. The applicability of a virtual mass approach for loss-of-coolant-accidents has not been defined, primarily due to the assumptions of incompressible and inviscid fluid flow. A computer code considering the coupled hydro-structural interaction in the LOCA hydraulic force calculation is used to provide hydraulic and structural responses. Using these results, methods are presented for a) calculating and verifying the adequacy of the virtual mass, b) calculation of an equivalent structural damping for fluid viscous effects and c) a technique of including and virtual mass in a structural model. 14 refs.

32058 **Lateral loadings on snubber assemblies.** Raphael, L.S. (Bechtel Power Corp, Gaithersburg, Md). *HTD* [*Publication*] *(American Society of Mechanical Engineers);* **55**: 19-22(1981).

This paper examines the installation of snubber assemblies in power plants with respect to transverse or lateral loads as well as axial loads. Evaluation of the effects of low level, lateral loads was performed by analytical means. At higher loadings, the snubber assembly could no longer be treated as a column; therefore, the effects of lateral loadings was determined by test. The test consisted of applying both lateral and axial loads simultaneously. Results of both the analysis and the test showed that the application of lateral loads had a considerable effect on the snubber assemblies.

32059 **Summary of ASME Section XI pump and valve testing program for nuclear power plants and an assessment of its effect on plant availability.** Lamm, D.A.; Hageman, J.P. (Southwest Res Inst, San Antonio, Tex). *HTD* [*Publication*] *(American Society of Mechanical Engineers);* **49**: 87-99(1981).

In 1976, the Nuclear Regulatory Commission made changes to Section 50.55a, Paragraph (g) of 10CFR50, concerning inservice examination and testing requirements for all nuclear plants. An important part was the requirement that all nuclear plants implement inservice testing of certain pumps and valves to assure their operational readiness by including it in 10CFR50, a consistent program for testing was made mandatory on a larger number of safety-related components. Individuals involved in the plant design need a knowledge of the requirements for pump and valve testing if provisions for this activity are to be included in the design. There must be an awareness that pump and valve testing requirements will impact the design of safety-related systems, the writing of specifications and operational procedures, and the purchasing of components and instrumentation within these systems. This paper provides insight into the applications and requirements of the pump and valve testing program, and identifies the program's effect on plant availability through comparison of inservice testing programs with a summary of safety-related events at nuclear power facilities in 1977 and 1978. 18 refs.

32060 **Flow-induced vibration design guidelines, 1981.** Chen, P.Y. (Ed.). New York, NY; ASME (1981). 143p.

Proceedings includes 8 papers dealing with flow-induced vibration in conjunction with the advancement in nuclear power reactor technology. Topics covered include: flow of fluids, slip joints, heat exchangers, steam condensers, and structural design procedures for submerged structures. Four papers are abstracted and indexed separately.

32061 **Current topics in piping and pipe support design (symposium), 1981.** Van Stijgeren, E. (Ed.). New York, NY; ASME (1981). vp.

Proceedings includes 15 papers which reflect the sophistication in the pipe stress analysis and pipe support design techniques. The subjects range from practical to theoretical investigations and experimentation in the piping area. Topics covered include: piping systems and their supports in particular in nuclear power plants, anchor bolts, deadweight supports, load effects, steel and bimetallic pipes, fossil power plants, pressure elongation in piping systems, and seismic design methods. 7 papers are abstracted and indexed separately.

32062 **Seismic design of deadweight supports.** Wagner, S.E.; Anderson, M.J. (Westinghouse Hanford Co, Richland, Wash). *HTD* [*Publication*] *(American Society of Mechanical Engineers);* **53**: 29-33(1981).

Constant and variable spring supports are used to support the deadweight of piping systems. They are not designed to support pipe seismic loads. They are, however, subject to the base structure accelerations during a seismic event and must continue to support the pipe after the event. This paper discusses the analytical and test techniques used to qualify seismically deadweight supports for the liquid sodium piping on the Fast Flux Test Facility.

32063 **Generic methods for design of small-bore pipe supports.** Clark, G.L.; LaSalle, F.R. (Westinghouse Hanford Co, Richland, Wash). *HTD* [*Publication*] *(American Society of Mechanical Engineers);* **53**: 53-60(1981).

Large numbers of supports for small-bore, low-temperature pipe are utilized in nuclear power plants. These supports often must meet ASME code and project seismic design requirements. Detailed analysis for each support is time consuming and costly. This paper describes some economical generic methods developed to design and qualify supports for two-inch and smaller pipe operating at temperatures less than 300/degree/F, on the Fast Flux Test Facility. Uses of standard designs, standard support spacing tables, anchor bolt and baseplate considerations, and field qualification methods are discussed.

32064 **Evaluation of pipe support stiffness and its effect on piping response.** Chow, T.Y.; Chen, C.H.; Bilgin, O. (Stone and Webster Eng Corp, Cherry Hill, NJ). *HTD* [*Publication*] *(American Society of Mechanical Engineers);* **53**: 105-115(1981).

In performing stress analysis of nuclear piping systems, support stiffness values are first estimated and used as inputs to predict the responses of the piping systems. However, the actual support stiffness values will not be known until the supports are designed. The difference between the actual support stiffness and that used in pipe stress analysis may introduce changes in the piping response. Therefore, it is desirable to develop simplified criteria to assess the adequacy of the piping system with differences between estimated and actual support stiffnesses. The deviation of the piping response due to support stiffness variations is investigated. The deviations in static and dynamic responses are represented graphically as functions of the support stiffness and its variations. These graphs are useful for deriving the optimum support stiffness and the range of its variation that will bound the piping response deviation within an acceptable limit. 3 refs.

32065 **Dynamic analysis techniques--a sensitivity study for piping systems at a nuclear power plant.** Suryoutomo, H.; Bacher, R. (Earthquake Eng Syst Inc, San Francisco, Calif). *HTD* [*Publication*] *(American Society of Mechanical Engineers);* **53**: 159-171(1981).

The original seismic analysis of the piping systems for a nuclear power plant considered two different seismic load cases. Each case represented the response due to a combination of the vertical component and one of the two orthogonal horizontal components

(N-S or E-W) of an earthquake. The highest response of the two load cases was used to evaluate the piping systems. The current USNRC Regulatory Guide 1.92 requires that all three earthquake components shall be considered to act simultaneously on the systems with special consideration of the closely spaced modes. The study presented in this paper was performed to evaluate the differences in the piping stresses and pipe support loads obtained from these two analytical approaches. This study also includes the effect of the differential seismic anchor movements, calculated support stiffnesses and the effects of closely spaced modes in the modal summation procedure, and compares the relative results of the two analytical approaches. 4 refs.

32066 **Importance parameters for reliability analyses of systems.** Nagel, K.; Weber, G. pp 145-152 of Technische Zuverlaessigkeit. Ihre Verwirklichung unter den Bedingungen der Zukunft. Duesseldorf, Germany, F.R.; VDI-Verlag (1981). (In German)

From 11. meeting - how to achieve technical reliability under conditions relating to the future; Nuernberg, Germany, F.R. (13 - 15 May 1981).

In order to judge the reliability and availability of systems, the influence of their components and sub-systems must be known. The authors show how this influence can be quantified. They give a review of parameters which permit a weighting. The possibility of sensitivity analysis is pointed out. It is assumed that systems can be represented in fault trees. The parameters introduced here are summarized under the heading 'importance parameters'. With these parameters, problems of planning design, operation, outage, and failure detection can be answered. A comprehensive presentation has not been intended. On the one hand, results of the guideline activities of the VDI Committee on Technical Reliability have been used. On the other hand, considerations and applications on this field of problems in nuclear engineering are presented. The methods are not restricted to one technology.

25 ENERGY STORAGE

2506 Thermal

REFER ALSO TO CITATION(S) 32099

32067 **(PNL-SA—9891) Cost of heat from a seasonal source.** Reilly, R.W.; Brown, D.R.; Huber, H.D. (Pacific Northwest Lab., Richland, WA (USA)). 1981. Contract AC06-76RL01830. 10p. (CONF-811066—7). NTIS, PC A02/MF A01. Order Number DE82006026.

From International energy storage conference; Seattle, WA, USA (19 Oct 1981).

Results are reported of an investigation to estimate the cost of aquifer thermal energy storage (ATES) from a seasonal heat source. The cost of supplying energy (hot water) from an ATES system is estimated. Three types of loads are investigated: point demands, residential developments, and a multidistrict city. The point demand investigation estimates the cost of ATES-supplied process heat for an industrial user, or space conditioning heat for an entity with an existing hot water distribution system, such as an airport or university. The residential systems investigated are homogeneous developments of: (1) suburban single family homes; and (2) high-rise apartments, under two climatic conditions - a cold climate as typified by Minneapolis, Minnesota, and a moderately cool climate as typified by Seattle, Washington. The multi-district city investigated is Richland, Washington, with a climate midway between that of Seattle and Minneapolis. Several technical and economic factors are found to control the economic performance of an ATES system. Costs are found to be prohibitive for systems of small size, long transmission distances, and employing expensive purchased thermal energy. ATES is found to be cost-competitive with oil-fired and electric hot water delivery systems under a broad range of potential situations. (LEW)

2509 Batteries

REFER ALSO TO CITATION(S) 32127, 32129

32068 **(CONF-790526—3) Ceramics in high-performance batteries.** Gordon, R.S.; Miller, G.R.; Hadnagy, T.D.; McEntire, B.J.; Rasmussen, J.R. (Ceramatec, Inc., Salt Lake City, UT (USA)). 1979. Contract EC-78-C-01-5162. 23p. NTIS, PC A02/MF A01. Order Number DE82005102.

From 4. international meeting on modern ceramic technologies; St Vincent, Italy (28 May 1979).

The state of the art properties which are currently achievable in sodium and lithium ion conducting ceramic electrolytes and in ceramic electronic conducting current collectors are reviewed. The application of these materials in high performance batteries such as sodium-sulfur are discussed. The fabrication techniques and in-cell performance characteristics of these materials in tubular form are evaluated.

32069 **(CONF-8009134—2) Fabrication and characterization of NASICON electrolytes.** Gordon, R.S.; Miller, G.R.; McEntire, B.J.; Beck, E.D.; Rasmussen, J.R. (Ceramatec, Inc., Salt Lake City, UT (USA)). 1980. Contract EC-78-C-01-5162. 3p. NTIS, PC A02/MF A01. Order Number DE82006837.

From 3. international meeting on solid electrolytes; Tokyo, Japan (15 Sep 1980).

The fabrication and performance testing of NASICON (Na/sub 1+x/Zr_2Si/sub x/P/sub 3-x/O_{12}) solid electrolytes in sodium-sulfur batteries are discussed. (WHK)

32070 **(NP—2901049) Development of a modularized battery.** Koethe, H.K. (Bundesministerium fuer Forschung und Technologie, Bonn (Germany, F.R.)). Feb 1980. vp. (In German). NTIS (US Sales Only), PC A06/MF A01. Order Number DE82901049.

Under the development contract, 93 hermetically sealed nickel-cadmium cells SD 15 K-GfW were manufactured in a fully inspected manufacturing procedure including mandatory inspection points. The qualification of the cells for use in space missions with a very high level of mechanical stress has been demonstrated succesfully by submitting 16 of these cells chosen at random to a qualification test procedure performed under a separate contract. The test levels of this procedure were chosen such that the cells successfully tested could be used in any space mission. In parallel to the manufacture of the lot of cells, the qualification of which could be demonstrated later, a battery module of 24 cells was developed. The mechanical test levels applied to this module were chosen to meet the requirements of the launcher ARIANE. Thermally, the construction should allow cold plate temperatures ranging from -10°C to +30°C. By development tests performed on 3 modules each containing 24 cells of the qualified lot of SD 15 K-GfW cells, it was demonstrated that the requirements could be met. A performance specification of the 15 AH/28 V-Module was established.

32071 **(NYSERDA—80-36) Advanced-battery electrochemical-process development. Final report.** Dunn, B. (General Electric Co., Schenectady, NY (USA). Energy Systems Programs Dept.). Sep 1980. 46p. NTIS, PC A03/MF A01. Order Number DE82901432.

The purpose of this program is to continue the development of the Na/S advanced battery energy storage system in order to determine technical and manufacturing feasibility and to evaluate market potential. The efforts are primarily concerned with the life and performance goals for Na/S batteries. Over the past two years GE has been actively engaged in characterizing cell behavior over prolonged cycling periods. The results indicated that cell resistance increased over extended cycling time (e.g., aging). Results of recent experimental work made it clear that additional work was needed to understand the aging phenomenon with the intent being that this effect could be minimized. The results of work performed during the past year at understanding the phenomenon of resistance increase in a Na/S battery are reported. (WHK)

32072 **Resistance after firing protected electric match.** Montoya, A.P. (to Department of Energy). US Patent 4,299,168. 10 Nov 1981. Filed date 20 Mar 1980. vp.
PAT-APPL-132356.

An electric match having electrical leads embedded in flame-producing compound is protected against an accidental resistance across the leads after firing by a length of heat-shrinkable tubing encircling the match body and having a skirt portion extending beyond the leads. The heat of the burning match and an adjacent thermal battery causes the tubing to fold over the end of the match body, covering the ends of the leads and protecting them from molten pieces of the battery.

29 ENERGY PLANNING AND POLICY

32073 **(NP—2901047) Progress report 1979/1980.** (Vereinigung Industrielle Kraftwirtschaft (VIK) e.V., Essen (Germany, F.R.)). [nd]. 58p. (In German). NTIS (US Sales Only), PC A04/MF A01. Order Number DE82901047.

The VIK (Vereinigung Industrielle Kraftwirtschaft) has the task as trade association to a general promotion of industrial power economy ensuring the common power economical interests of its members. This is possible particularly due to technical-scientific research; collecting and exchange of operational experience; and to the representation of common power economical interests of the authorities and other positions. The present activities report is classified into five sections: German energy policy; the law in power economy; power economy, electricity, and fuels; technology; and cooperation with public relations members.

2901 Energy Analysis And Modeling

32074 **Energy-supply model MESSAGE.** Schrattenholzer, L. Laxenburg, Austria; International Institute for Applied Systems Analysis (1981). 38p. (IIASA-RR—81-31). National Technical Information Service, Springfield, VA 22161.

This paper describes the general form of MESSAGE (Model for Energy Supply Systems And Their General Environmental Impact), a dynamic linear programming model minimizing total costs of energy supply over a given time horizon. It balances secondary energy demand, which is disaggregated into sectors and exogenous to the model, with primary energy supply, given as a set of resource availabilities which are disaggregated into an optional number of cost categories by choosing from a given set of energy conversion technologies. The most important application of MESSAGE so far has been in the description of the IIASA global energy scenarios. A set of models and formalized procedures, each describing one part of the energy system, is arranged in a loop. Iterative application of this model loop leads to globally consistent scenarios in the development of the global energy system. The most important connection for MESSAGE in this loop is with the energy demand model MEDEE-2 that provides the demand data for MESSAGE. Information on energy costs flows back to the demand model. With this application in mind it was felt that the model description could be made more specific if some generality of the model features was omitted in favor of a clearer exposition. Thus, some variables that can be chosen by the model user to suit a particular application are replaced here by the values they assumed in the global study. A case in point is the description of the energy chain; here it stops at the level of secondary energy as in the global scenarios, whereas the generic model formulation also permits consideration of final or useful energy. Section 2 gives a short summary of the model system used for the global scenarios; Section 3 describes the MESSAGE model; Section 4 briefly discusses general aspects of applications of MESSAGE and reports on experiences with its usage for countries and regions other than those used in the global study.

32075 **(NP—2901424) Discussion on the hard or soft way in future energy supply.** Michaelis, H. [nd]. 22p. (In German). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82901424.

The soft ideology of energy supply is discussed in a condensed form in this volume presented to Hans K. Schneider on the occasion of his 60th birthday. After having assessed all arguments, the author comes to the conclusion that problems involved in future energy supply may be solved in a better way by a well-functioning market economy than by means of dirigistic measures required for realizing the soft path of energy supply.

2902 Economics And Sociology

REFER ALSO TO CITATION(S) 31745, 32075, 32083, 32097

32076 **(NP—2901082) Public supply utilities in 1976 and 1977 in figures.** (Verband Kommunaler Unternehmen e.V., Koeln (Germany, F.R.)). 1979. 170p. (In German). NTIS (US Sales Only), PC A08/MF A01. Order Number DE82901082.

The statistics at hand is the result of an investigation focusing on industrial management. It was made by the association together with its member utilities in a two years' rhythm. This statistics is intended to permit member utilities to orient themselves by means of relevant standard values, and possibly, to draw conclusions from them (giving rise to measures of rationalization). The results obtained are divided into 7 categories according to the size of the companies concerned.

32077 **Price forecasting in DOE's short-term integrated forecasting system.** Sitzer, S.; Paxson, D.; Gamson, N. (Energy Information Administration, Washington, DC). *Energy Economics, Policy and Management;* **1**: No. 3, 48-64(Win 1982).

The overview of DOE's short-term price forecasting models explains its value in tracking the flow of major fuels and trends in energy markets. The short-term model is a compromise of full-scale behavioral modeling and simple extrapolation. The article then describes petroleum, natural gas, and residential electricity price forecasts. Suggested areas for further research include additional demand and price factors as well as time considerations. 1 figure, 5 tables. (DCK)

32078 **Prospects of energy policy from the view of the Deutscher Gewerkschaftsbund.** Pfeiffer, A. *Energiewirtschaftliche Tagesfragen;* **31**: No. 10, 747-750(Oct 1981). (In German).

Prospects of energy policy are both economic and social prospects - thus problems of energy policy are also both economic and social problems. The socio-political question is: how are we going to live in the future. The economic question is: how can and shall we be able to live and survive from the economical point of view now and in the future. Both problems cannot but be dealt with simultaneously because the possible answers are closely linked together.

32079 **Trade unions present clear attitude concerning energy policy.** Hoffmann, K.H. *Energiewirtschaftliche Tagesfragen;* **31**: No. 10, 750-753(Oct 1981). (In German).

The fundamentals of the attitude of the trade unions in the F.R. of Germany concerning energy policy are explained. An urgent appeal to the politicians as to acting in time and determinedly is related to this attitude.

2903 Environment, Health, And Safety

REFER ALSO TO CITATION(S) 32074, 32096, 32481, 32598, 32599, 32600

32080 **(DOE/EV/10025—T1) Environmental Issues Briefing Book sections concerning water quality and solid waste regulatory issues impacting DOE plans and programs.** (Hart (Fred C.) Associates, Inc., New York (USA)). Dec 1978. Contract AC02-79EV10025. 319p. NTIS, PC A14/MF A01. Order Number DE82006190.

This planning report covers: water; solid waste; toxic materials; federal land management; coastal and inland land use management; and summaries on the integrated environmental picture. (PSB)

32081 **(NP—2901083) Annual report for 1979 of the Umweltbundesamt (Federal Environmental Agency).** (Umweltbundesamt, Berlin (Germany, F.R.)). 1979. 147p. (In German). NTIS (US Sales Only), PC A07/MF A01. Order Number DE82901083.

The main part of the annual report deals with the activities of the groups and expert departments of the Federal Environment Agency. Relevant work in the field of energy was done on the reduction of emissions in energy production, the application of heat pumps, and energy production from waste. The annex reports about external activities (reports, publications, meetings) of the Federal Environment Agency.

2904 Natural Resources

REFER ALSO TO CITATION(S) 32104

32082 (LBL—13324, pp 20-44) **Minerals critical to the development of future energy technologies in high and low solar scenarios.** Sep 1981. NTIS, PC A03/MF A01.

In Technology assessment of solar-energy systems: Part I. An analysis of life-cycle costs of solar facilities. Part II. Minerals critical to the development of future energy technologies in high and low solar scenarios.

Solar and renewable technologies account for most of the increase in material requirements for energy technologies. The analysis identified 20 minerals where domestic reserves are inadequate to meet the demand. Domestic mine capacity is inadequate for 23 minerals. However, the world wide mine production capacity is adequate to meet the US demand for all the minerals. Energy related demand can therefore provide a potential market for some of these 23 minerals provided the US has deposits that can be exploited at worldwide competitive prices. For some critical and strategic minerals such as chromium the US demand peaks during a time period different than the period during which world demand peaks. The time period differences will help smooth market fluctuations and reduce the US vulnerability. Alternative technology designs can help mitigate adverse supply disruptions or sharp price increases. Alternatives may not always be available for a specific strategic and critical mineral. Each mineral may have to be analyzed and evaluated on its own merits before comparative options can be completely analyzed.

2905 Research, Development, Demonstration, And Commercialization

REFER ALSO TO CITATION(S) 32311

32083 **(DOE/TIC—2007065) Federal energy R and D priorities. Report of the Research and Development Panel, Energy Research Advisory Board.** (Department of Energy, Washington, DC (USA)). Nov 1981. 82p. NTIS, PC A05/MF A01. Order Number DE82007065.

The Energy Research Advisory Board (ERAB) participated in an assessment of the US Department of Energy's major program areas. This assessment features an evaluation technique in which each member of ERAB evaluated 49 program areas covering all DOE energy R and D programs in terms of seven criteria for energy supply and conservation programs and five criteria for science and technology base programs. Each member evaluated the relative importance of these criteria and judged whether more, less, or the same amounts of money relative to the President's request for FY 1982 should be allocated to the various programs. The judgements of the Board members were combined numerically to arrive at figures of merit for each program on the relative priorities of energy technologies and whether financial allocations to each program should be increased, held the same or decreased relative to the President's request for FY 1982. The resulting figure of merit was used to rank the programs in order of importance. Criteria used in evaluating the priority of each technology were selected and the definitions for each criterion agreed upon were technology potential, urgency, economic potential, benefit/cost, energy/national security, health/safety/environment, and Federal RD and D role. The criteria for the Science and Technology Base programs were scientific potential, risk/benefit, mission impact, urgency and federal role. A detailed definition of these criteria is given.

32084 **(NP—82901096) Joint research promotion by Bund and Laender. Cooperation between Bund and Laender in the joint project of research promotion according to Article 91 b, GG.** (Bundesministerium fuer Forschung und Technologie, Bonn (Germany, F.R.)). 1980. 164p. (In German). NTIS (US Sales Only), PC A08/MF A01. Order Number DE82901096.

Basing on Paragraph 91 b of the Grundgesetz Bund and Laender have re-arranged their cooperation in the field of research promation which had been developed pragmatically until then by a series of regulations and agreements. Within this framework the Deutsche Forschungsgemeinschaft and Max-Planck-Gesellschaft are promoted in particular as well as numerous research institutes, body organization and service institutions for research. With an annual total amount of more than 3 billion DM this joint promotion covers nearly a fifth of all governmental shares for research and development in the Federal Republic of Germany. Thus this joint operation of Bund and Laender is one of the most important factors for successful German research policy. For all who participate in this cooperation in politics, economics, and administration this brochure, which is presented in a totally revised edition, compiles the most important principles and rules in a compact form. Furthermore, it is supposed to make the system of the joint research promotion clear to lookers-on.

32085 **New connections for new technologies.** Lihach, N.; Ferraro, R. *EPRI (Electric Power Research Institute) Journal;* 7: No. 1, 6-13(Jan 1982).

New energy technologies are fast converging on utility electricity networks, but these networks are designed for alternating current (ac) power from large central power plants. Research is needed in direct current (dc)-to-ac power conditioning, appropriate generation planning, revised operation and control strategies, and institutional issues before technologies, such as fuel cells, storage batteries, photovoltaic arrays, and wind turbines can produce electricity for customers. 6 figures.

32086 **Amorphous metals: cutting losses in the core.** Douglas, J.; Norton, E. *EPRI (Electric Power Research Institute) Journal;* 7: No. 1, 14-17(Jan 1982).

Amorphous metal alloys with an internal structure similar to glass are made by cooling molten alloys so fast that the atoms and molecules cannot crystallize. The physical changes in metallic glasses include increased strength, corrion resistance, and magnetic softness. The latter quality makes amorphous alloys suitable for transformers because it minimizes energy losses. An Electric Power Research Institute (EPRI) research program is developing a cost-effective technique for manufacturing metallic glass transformer ribbons with new annealing techniques and either a modified casting or bonding process. Amorphous metal ribbon for transformers should be ready for commercial production by 1985. Utilities with high power costs will be the first to benefit. 1 figure. (DCK)

32087 **International cooperation in energy R & D.** Lawrence, C. (EPRI, Washington, DC). *EPRI (Electric Power Research Institute) Journal;* 7: No. 1, 26-30(Jan 1982).

International participation in Electric Power Research Institute (EPRI) research programs is an example of a growing trend toward cooperative efforts involving collaboration between national governments, the International Energy Agency (IEA), the Organization for Economic Cooperation and Development (OECD), and other groups. Cooperation includes information exchanges, scientific meetings, tasksharing, and technology transfers, many of which are now aimed at reducing the effects of future oil shocks. Joint test facilities are sponsored by IEA, although the US also has bilateral agreements with individual nations that reflect political and technical considerations. The US tradition of marketing technical information, with no counterpart abroad, may put the US at a competitive disadvantage as other countries increase their research efforts. (DCK)

2906 Nuclear Energy

REFER ALSO TO CITATION(S) 31745, 31797, 31952, 32051

32088 **(NP—2901053) Possibilities and limits of oil substitution.** (Kraftwerk Union A.G., Berlin (Germany, F.R.)). Jul 1980. 18p. (In German). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82901053.

Possibilities and limits of substituting mineral oil by coal and nuclear energy are dealt with. The power plant delivering electric power, district heat, and process vapour is in the centre of the strategy of substitution, nuclear energy successively taking over the role of coal in the current production and making it available for coal gasification and coal liquefaction. The sphere in which petroleum is used is reduced to the section of traffic and the non-energetic consumption of the chemical industry. Thus, in the year 2000 ca. 110 million tons SKE mineral oil are expected to be saved by direct and indirect use of coal.

2910 Conservation

REFER ALSO TO CITATION(S) 31754, 32083, 32094, 32115, 32121

32089 **(CONF-810370—) Energy conservation management conference.** Durocher, P. (ed.). (Bonneville Power Administration, Portland, OR (USA)). 1981. 131p. NTIS, PC A07/MF A01. Order Number DE82006898.

From 8. annual energy conservation management conference; Portland, OR, USA (17 Mar 1981).

The five-year energy conservation program at Bonneville Power Administration (BPA) is described at the conference. An overview of the program is presented. Topics covered in panel discussions include: how utilities can work effectively with weatherization contractors, homebuilders, energy auditors, and weatherization material suppliers; mechanisms for implementing conservation programs in the commercial sector; experiences gained in existing residential weatherization programs; and streamlining relationships between consumers, utilities, and BPA in providing services and getting feedback. The planning, programming, technical assistance, and engineering thrusts of BPA's conservation programs are discussed. Indoor air quality, renewable energy, and the regulator's role in relationships to energy conservation are discussed. Passive solar programs, DOE initiatives in solar and conservation for buildings, conservation potential in the commercial and industrial sectors, and current conservation research and development are also discussed. (MCW)

32090 **(NP—2901085) More kilometers with less gasoline.** (Bundesministerium fuer Wirtschaft, Bonn (Germany, F.R.). Referat Presse und Information). Mar 1980. 19p. (In German). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82901085.

This brochure, published by the Federal Minister of Economics, shows drivers how and by what means to save gasoline.

2920 Supply, Demand, And Forecasting

REFER ALSO TO CITATION(S) 31735, 31843, 32074, 32076, 32088, 32103

32091 **(CONF-801152—3) Oak Ridge Industrial Model: an introduction.** Reister, D.B.; Barnes, R.W.; Edmonds, J.A. (Oak Ridge National Lab., TN (USA); Oak Ridge Associated Universities, Inc., TN (USA); Oak Ridge Associated Universities, Inc., Washington, DC (USA). Inst. for Energy Analysis). 1980. Contract W-7405-ENG-26. 15p. NTIS, PC A02/MF A01. Order Number DE82004085.

From Electric Power Research Institute workshop; Atlanta, GA, USA (17 Nov 1980).

The Oak Ridge Industrial Model (ORIM) was initially developed for the Energy Information Administration to forecast demand for five types of fuel and electricity by the manufacturing sector in the ten federal regions. Recently, the model has been used by the office of Coal Utilization to forecast market penetration of new technologies which use coal. ORIM divides the national market into about 100,000 submarkets based on region, industry, vintage of capital stock, and characteristic type of energy service. For each of the submarkets, ORIM estimates the probability that a fuel will capture the submarket. Regional forecasts are obtained by summing over the submarkets. The ORIM energy demand forecasts are influenced by energy prices, the fuel use act, tax regulations, and environmental regulations.

32092 **(EPRI-EA—235-Vol.3) User's guide to the data tapes from EPRI projects. Research projects 431-1 and 431-2.** Blattenberger, G. (Data Resources, Inc., Washington, DC (USA)). Dec 1976. 256p. NTIS, PC A12/MF A01. Order Number DE82902007.

This volume provides a user's guide to the three EPRI data tapes on the residential demand for electricity. The primary purpose of the guide is to assist those interested in conducting analysis using the data, and as such it is not required material for those interested only in the RP431 analysis. The tapes contain the data reported in Volume II and analyzed in Volume I of EA-235, as well as the disaggregate data upon which those estimates were based. In many cases, the procedures for constructing the RP431 data are also on the tapes. The actual data are described extensively in Volumes I and II, but in general these consist of state appliance stock estimates and declining block rate structure data series.

32093 **(NP—2901890) Comprehensive Energy Plan.** (Maine Office of Energy Resources, Augusta (USA)). Fal 1980. 125p. NTIS, PC A06/MF A01. Order Number DE82901890.

This working paper is an attempt to establish a comprehensive, balanced, and practical plan for dealing with Maine's energy problems in the future. This Plan proceeds in its format according to the following precepts. First, the Maine Energy Overview section provides an analysis of Maine's historical energy supplies and demands. A price-related analysis is included as well as some key projected trends. The Maine Energy Overview section provides a technical backdrop for the specific recommendations outlined in the Action Program portion of the Plan. The Action Program details a host of initiatives which, if aggressively implemented, will help provide for a secure and affordable energy future. The Action Program is broken into several key areas: Conservation, Renewable Resource Development, Fossil and Nuclear Sources Utilization, Education and Information Efforts, Canadian Energy and Emergency Contingency and Economic Hardship Planning. Within each of these areas, specific subject areas are addressed. A goal is identified and both existing and new initiatives are described. In the Conclusion, an attempt has been made to identify how the Action Program may be put in place. The conviction that State Government must build on existing partnerships with various sectors of the Maine community, and establish many new partnerships is emphasized. A detailed technical appendix provides information intended and conclusions drawn to serve as references to many of the statements and conclusions expressed in the Action Program. Materials which provide more in-depth information on OER programs and State Government initiatives are also provided.

32094 **(NP—2902311) Nebraska Energy Office. Annual report, 1981.** (Nebraska Energy Office, Lincoln (USA)). 31 Dec 1981. 46p. Nebraska Energy Office, P.O. Box 95085, Lincoln, NE 68509.

The report highlights the Nebraska Energy Office programs aimed toward assuring a secure energy future, setting out future priorities to increase energy efficiency in homes, businesses, and government. The detailed management plan completed in 1981 is briefly described. Information dissemination programs in the energy field are described. Information on the future of renewable resources, legislation and planning that covers the entire energy field, and a listing of the personnel and financial resources involved are given. The creation of a Nebraska-specific energy demand model, using economic and weather conditions to determine the amount of energy demanded by the residential, commercial, industrial, agricultural, and transportation sectors, is noted. Nebraska energy supply and energy consumption data are included. (MCW)

2930 Policy, Legislation, And Regulation

REFER ALSO TO CITATION(S) 32093, 32094

32095 (NP—2900614) Planning of heat supply. Instruction 1. Surveying. Nov 1980. 138p. (In Danish). NTIS (US Sales Only), PC A04/MF A01. Order Number DE82900614.

The basis of this guidance is law on heat supply 1. Sep. 1979, which says that the Misistry of Energy in cooperation with local councils and county councils has to prepare a national planning of heat supply. This guidance specially emphasizes the foundation of planning for the establishing of collective heat supply based on natural gas and surplus heat. A description is given of the law on heat supply, of the relationship between the authorities, and the connection between the surveying and the planning. The different steps in the surveying are described, and the result of this survey is a so-called energy atlas. Furthermore examples are given of regional energy maps.

32096 (NP—2903327) Economic-impact study of proposed IPCB amendments to water-pollution regulations, R80-6. Document No. 82/06. (Illinois Dept. of Energy and Natural Resources, Chicago (USA); Ducharme (Robert G.), Inc., Deerfield, IL (USA)). Feb 1982. 48p. State of Illinois-Dept. of Energy and Natural Resources, 309 W. Washington St., Chicago, IL 60606.

The main objective of these proposed changes is to clarify, update and otherwise improve the regulations through a variety of steps, namely: 1. Expansion of opportunities for remedial action by individuals and local wastewater agencies affected by the regulations. 2. Clarification of remedial options available, the types of sewer connections exempt from Agency permits, and elimination of other ambiguities in the regulations. 3. Improvements in due process through codification and formalization of informal procedures and practices currently followed by the Board and the Agency. 4. Elimination of obsolete language and updating of the language to relate the regulations to current federal law. The changes cut across a wide spectrum of Board and Agency procedures and practices relating to variances, permit appeals, permits exemption and the preparation of data reports, guidelines and responses all of which involve time and expense by individuals, local wastewater authorities, the Board and the Agency. Some of the changes are expected to encourage more activity and increase administrative costs. No substantive changes are proposed.

2940 Fossil Fuels

REFER ALSO TO CITATION(S) 31744, 31745, 31754, 31754, 31771, 32088, 32524, 32911

32097 (NP—2901055) Investment requirements in the energy sector and their financing. Diel, R.; Radtke, G.; Stoesel, R. [nd]. 31p. (In German). NTIS (US Sales Only), PC A03/MF A01. Order Number DE82901055.

The present research study illustrates the required volume of investment in the energy sector during the next two decades while referring explicitly to the availability of financial resources. The data for the respective primary energy sources and electric power production relate to the Federal Republic of Germany; still, as far as figures were available, the energy situation of the Western World is taken into account. Starting from the premise that energy needs will continue to grow - albeit at a slower rate -, future investment activity will have to depart from past trends, with their more or less evenly spread recourse to all available primary energy sources, to a substantial reliance on nuclear energy, coal and natural gas as against oil. In addition to the higher capital requirements due to the restructuring of the energy supply, future investment will be characterized by particularly capital-intensive projects and, in addition, by the fact that expensive development schemes must be vigorously pursued. This applies not only to coal gasification and liquifaction but also to regenerative energy sources.

2950 Hydrogen And Synthetic Fuels

REFER ALSO TO CITATION(S) 31771

2960 Electric Power

REFER ALSO TO CITATION(S) 31744, 31902, 31903, 31913

32098 (EPRI-EA—2153-Vol.1) Decision framework for technology choice. Volume 1. A case study of one utility's coal-nuclear choice. Keeney, R.L. (Woodward-Clyde Consultants, San Francisco, CA (USA)). Dec 1981. 247p. NTIS, PC A11/MF A01. Order Number DE82902213.

The technology choices facing an individual utility are extremely complex decision problems. The purpose of this report is to provide and document a method designed to assist the utility industry in making these choices in a logically consistent manner. The resulting evaluation model, based on the principles of decision analysis, explicitly addresses the complexity in a way that can be articulated, supported, and defended before reviewers. After discussing that evaluation model and its components in detail, its application is demonstrated using a coal-nuclear choice which will be faced by Utah Power and Light Company in the near future. The case study is only meant to be illustrative. Its purpose is to demonstrate the methodology. In an actual application, more attention would be needed to develop appropriate assumptions and the specific data for the analysis.

32099 (EPRI-EM—2193-Vol.3) 1980 survey and evaluation of utility conservation, load management, and solar end-use projects. Volume 3: utility load management projects. Final report. (Energy Utilization Systems, Inc., Pittsburgh, PA (USA)). Jan 1982. Contract W-7405-ENG-26. 344p. NTIS, PC A15/MF A01. Order Number DE82007247.

The results of the 1980 survey of electric utility-sponsored energy conservation, load management, and end-use solar energy conversion projects are described. The work is an expansion of a previous survey and evaluation and has been jointly sponsored by EPRI and DOE through the Oak Ridge National Laboratory. There are three volumes and a summary document. Each volume presents the results of an extensive survey to determine electric utility involvement in customer-side projects related to the particular technology (i.e., conservation, solar, or load management), selected descriptions of utility projects and results, and first-level technical and economic evaluations.

32100 (NP—2901048) Statistics report '80. (Zentralverband der Elektrotechnischen Industrie e.V. (ZVEI), Frankfurt am Main (Germany, F.R.)). 1980. 55p. (In German). NTIS (US Sales Only), PC A04/MF A01. Order Number DE82901048.

The present statistics of the electrochemical industry in the year 1979 shows in tabular form the most important figures in the fields of production and prices, number of orders and turnover, occupation, export trade, and regional division of the electroindustry.

32101 (NP—2901089) Simulation methods for systems analysis in electric power supply. Grafoner, P. (Dortmund Univ. (Germany, F.R.). Abt. Elektrotechnik). 5 Feb 1979. 162p. (In German). NTIS (US Sales Only), PC A08/MF A01. Order Number DE82901089.

Thesis.

The dissertation discusses simulation systems in electric power supply, structure and use of the graphical interactive simulation system GISS, dynamic long-term simulation of electric power supply systems, and the numerical solution of rigid systems of differential equations.

32102 Integrating new sources into utility systems. Kalhammer, F.R. *EPRI (Electric Power Research Institute) Journal;* 7: No. 1, 2-3(Jan 1982).

Small-scale dispersed power generation may be a promising development for the 1980s as utilities begin operating fuel cell and renewable energy power plants, better storage systems, cogenera-

tion, and other schemes. Utilities have found that the facilities must be integrated into the system to provide reliable and economic power. Utilities are developing the technology to convert direct current to alternating current on a small scale, and they are determining how to plan for fluctuations in the power output of these sources. Safety, ownership, and financing issues remain to be solved. (DCK)

2980 Consumption And Utilization

REFER ALSO TO CITATION(S) 31736, 32110

32103 **(NP—2901052) Data on the development of the West German power industry in 1979.** (Bundesministerium fuer Wirtschaft, Bonn (Germany, F.R.)). Jun 1980. 59p. (In German). NTIS (US Sales Only), PC A04/MF A01. Order Number DE82901052.

After a general review of the national and international energy situation and some general remarks concerning the supply of the most important energy sources in the Federal Republic of Germany, detailed figures of energy production, consumption, and trade are presented in tabular and graphical form in comparison with past years, help to make trends clearer.

2990 Unconventional Sources And Power Generation

REFER ALSO TO CITATION(S) 31837, 31845, 31846, 31847, 31850, 31862, 31870, 31897, 32082, 32116

32104 **(DOE/ET/20091—1) Report of the economic study panel of the inexhaustible resources study. Report No. CMU No. 1-53083.** (Carnegie-Mellon Univ., Pittsburgh, PA (USA)). Sep 1977. Contract AS02-77ET20091. 43p. NTIS, PC A03/MF A01. Order Number DE82007530.

The date of commercial demand for inexhaustible resources (IER) technologies through 2050 is estimated by examining the supply and demand for energy. Energy demand is sensitive to the growth rate of GNP and to the rate at which energy prices increase. Constant energy prices combined with an annual growth in GNP of coal availability is of overwhelming importance in evaluating the window for IER. If coal availability is unlimited (because there are not problems with the environment or safety), the IER are never attractive. The size of the oil and gas resource base, and to a lesser extent the uranium and shale oil resource base, are important to planning the R and D and commercialization of the IER; thus, ways to promote exploration of the resource base ought to be explored. R and D on technologies that substitute other inputs for energy is of high value; the price of energy should reflect the total social cost of producing an additional Btu, as well as its scarcity value, if conservation is to work. Since there is little feedback from energy to GNP, goals regarding GNP growth are relatively independent of energy resources. The cost of electric IER is a crucial parameter, while the cost of nonelectric IER is less sensitive. Thus, a target date for commercialization of electric IER should be set no earlier than 2010, with substantial effort being devoted to research to make the technology cheaper and publicly acceptable. Non-electric IER should have at least as high a priority as electric IER, with most attention given to making it available as early as 1990. The cost of banning one of the IER technologies is relatively small, e.g., the breeder reactor, as long as a substitute IER technology is available.

32105 (LBL—13324, pp 1-19) **Analysis of life cycle costs of solar facilities.** Sep 1981. NTIS, PC A03/MF A01.

In Technology assessment of solar-energy systems: Part I. An analysis of life-cycle costs of solar facilities. Part II. Minerals critical to the development of future energy technologies in high and low solar scenarios.

The life cycle costs over a range of technological and economic assumptions were compared to investigate the trade offs among solar and renewable energy technologies, and between centralized and decentralized technologies. These costs were studied under different financial conditions by varying the interest rates, tax rates, and taxable lifetimes. For wood stoves, the fuel price was varied over a wide range. For some technologies cost estimates for alternative designs were compared with the original TASE characterizations. Life cycle costs under different financial conditions were compared by calculating the derivatives of the fixed charge rate (FCR) with respect to the discount and tax rates for taxable lifetimes ranging from 5 to 30 years. At the upper end of this range (15 years or more) the FCR is not sensitive to the taxable lifetime. Fuel costs for wood stoves were varied from zero to $600 per year. This covers a range of prices from a rural consumer gathering his own wood to an urban consumer who purchases four cords of delivered wood at $150 per cord. This spread in fuel costs results in the life cycle costs varying over a factor of four from $2.58 to $6.33 per million Btu.

30 DIRECT ENERGY CONVERSION

3001 Mhd Generators

32106 **Correlation between results of zone method and experiment in radiative heat transfer.** Sistino, A.J. (Argonne Natl Lab, Ill). *American Society of Mechanical Engineers, [Paper];* No. 81-HT-71, vp(Aug 1981).

The zone method is used to simulate the radiative and conductive heat transfer characteristics of an engineering test facility. The results obtained with the zone method are compared to those measured in the subject facility, and it is found that the theoretical and experimental results agree within five percent when the effective wall emissivity is taken to be 0.25. This effective wall emissivity is the product of the actual wall emissivity times the self-absorption factor of the radiation in the cool boundary layer. 13 refs.

32107 **Coal-fired open cycle MHD combustion plasmas: chemical equilibrium and transport properties workshop results.** Sullivan, L.D.; Klepeis, J.E.; Codere, W.J.; Fischer, W.H. (US DOE, Germantown, Md). *AIAA Paper;* No. 80-0091, vp(1980). (CONF-800104—).

From 18. AIAA aerospace sciences meeting; Pasadena, CA, USA (14 Jan 1980).

The primary purpose of this study was to provide DOE/ETF/MHD with an industry-wide overview of the computational methods and analysis that are currently in use, and to assist DOE in assessing the numerical and analytical complexities and capabilities of these methods, through evaluation of their comparative results. The use of coal as a fuel is described as an attractive option for producing a high temperature seeded plasma, which can generate electrical power in MHD channels. The MHD generator is combined with a steam bottoming plant which recovers the residual energy in the hot exhaust gases from the MHD channel.

3005 Fuel Cells

REFER ALSO TO CITATION(S) 31840

32108 **(BNL—51418) Survey of carbon and its role in phosphoric-acid fuel cells. Final report.** Kordesch, K.V. (Brookhaven National Lab., Upton, NY (USA); Technische Univ., Graz (Austria)). Dec 1979. Contract AC02-76CH00016. 214p. NTIS, PC A10/MF A01. Order Number DE82006841.

A study was performed to assess the current state of the art of carbon technology in respect to the application of carbon materials in phosphoric acid fuel cells. The physical-chemical properties of graphites and carbons are reviewed and the relevance of the data for the use of carbon as construction material, catalyst support, and actual electrocatalyst has been investigated. Manufacturing processes and methods for treating carbon materials were evaluated. Testing of carbon samples - as applicable to later electrode performance and cell life - is discussed. Manufacturers of carbons and their commercial products are listed and surveyed, and the availabilities and economical aspects compared. The patent literature was extensively searched, and the significant inventions are referenced.

32109 (DOE/NASA/10769—21) Summary and evaluation of the conceptual design study of a potential early commercial MHD power plant (CSPEC). Staiger, P.J.; Penko, P.F. (National Aeronautics and Space Administration, Cleveland, OH (USA). Lewis Research Center). Jan 1982. Contract AI01-77ET10769. 23p. (NASA-TM—82734). NTIS, PC A02/MF A01. Order Number DE82007562.

The conceptual design study of a potential early commercial MHD power plant (CSPEC) is described and the results of the study are summarized. For this study, each of two contractors did a conceptual design of an approximately 1000 MWe open-cycle MHD/steam plant with oxygen enriched combustion air preheated to an intermediate temperature in a metallic heat exchanger. The contractors were close in their overall plant efficiency estimates but differed in their capital cost and cost of electricity estimates, primarily because of differences in Balance-of-Plant material, installation, contingency, and operating and maintenance cost estimates. One contractor concluded that its MHD plant design compared favorably in cost of electricity with conventional coal-fired steam plants. The other contractor is making such a comparison as part of a follow-on study. Each contractor did a preliminary investigation of part-load performance and plant availability. The results of NASA studies investigating the effect of plant size and oxidizer preheat temperature on the performance of CSPEC-type MHD plants are also described. The efficiency of a 1000 MWe plant is about three points higher than that of a 200 MWe plant. Preheating to 1600°F gives an efficiency about one and one-half points higher than preheating to 800°F for all plant sizes. For each plant size and preheat temperature there is an oxidizer enrichment level and MHD generator length that gives the highest plant efficiency.

32 ENERGY CONSERVATION, CONSUMPTION, AND UTILIZATION

3201 Buildings

REFER ALSO TO CITATION(S) 32067

32110 (IIASA-WP—80-126) Growth of energy consumption and prices in the USA, FRG, France, and the UK, 1950-1979. Doblin, C.C. (International Inst. for Applied Systems Analysis, Laxenburg (Austria)). Aug 1980. 90p. NTIS (US Sales Only), PC A05/MF A01. Order Number DE82901419.

This paper examines data on GDP, industrial output, energy consumption, and price of fuels and electricity in Western developed countries for the period 1950 to 1979. The study of these times series may shed some light on the relationship between the growth of GDP and energy consumption, a relationship which seems to have entered a new phase following the first oil price explosion of 1973. In particular, information on the most recent developments in energy consumption in the face of escalating prices may assist in the study of price elasticities in this new situation. Prices are taken in current values and adjusted for general inflation; they are monitored by broad sectors of the economy (industry, households, transportation) and for groups of fuel commodities and electricity. The growth of energy consumption and prices is illustrated by a set of graphs in Part I. The major observations are given in Part II. The data are presented in table form in Part III. Part IV provides concepts, definitions, and sources of the variables selected.

32111 (INIS-mf—6766) Influence of buildings geometrical and physical parameters on thermal cooling load. Melo, C. (Santa Catarina Univ., Florianopolis (Brazil)). Sep 1980. 95p. (In Portuguese). NTIS (US Sales Only), PC A05/MF A01. Order Number DE82780240.

A more accurate method to evaluate the thermal cooling load in buildings and to analyze the influence of geometrical and physical parameters on air conditioning calculations is presented. The sensitivity of the cooling load, considering the thermal capacity of the materials, was simulated in a computer for several different situations.

32112 (LBL—13400) Development and use of a hemispherical sky simulator. Navvab, M. (Lawrence Berkeley Lab., CA (USA)). Oct 1981. Contract W-7405-ENG-48. 266p. NTIS, PC A12/MF A01. Order Number DE82005842.

Thesis.

The design, construction, and calibration of a sky simulator are reported. The configuration chosen employs an opaque reflecting dome structure. A procedure is developed for developing a lighting system that provides the desired luminance distribution, and the design of the sky simulator and of a direct sun simulator included are described. Capabilities of the system to simulate overcast, uniform, and clear-sky conditions are discussed along with the accuracy of the system. Operation of the facility for instruction and research uses is discussed. (LEW)

32113 (NP—2900741) Energy analysis of retail shops. (Faellesforeningen for Danmarks Brugsforeninger, Albertslund, Denmark). Sep 1980. 274p. (In Danish). NTIS (US Sales Only), PC A12/MF A01. Order Number DE82900741.

Analyses of the energy consumption of retail shops based on investigations of a part of the shops and on interviews. The measurements of the shops and the interviews show that the energy consumption is approximately 1.600 GWh. Evaluations are made of the possibilities of energy conservation, and they show that the yearly savings will be of 20-30% which corresponds to approximately 115 mill.kr./year or to 68 mill.litre of oil. Some of the means of energy conservation are : insulation, heat recovery from refrigerators and ventilation systems, thermostats, replacement of oil boilers. The different steps of energy conservation are commented systematically according to the following: 1. description,utilization, function, implementation, control, maintenance, 2. energy savings, 3. economy, investment, economic lifetime, pay-back period, yearly costs of maintenance. An economic method is described that may help to make an economic evaluation of investments and energy savings including the expected increase of prices. Furthermore a brief overview is given of possibilities of financing and subsidies according to legislation.

32114 (NP—2900953) White paper for rational energy use. Exemplary air conditioning, ventilation, and heating systems. (Foerderungsgemeinschaft Klima e.V. (FGK), Stuttgart (Germany, F.R.)). 1980. 100p. (In German). NTIS (US Sales Only), PC A05/MF A01. Order Number DE82900953.

This book presents 87 modern, energy-saving air conditioning and heating plants for offices and administrative buildings, for family dwellings, commercial buildings, hospitals, schools, and swimming pools. 19 plants in industry and 2 plants in airports illustrate the applications. The designing and constructing companies are mentioned for all plants; the particulars and the energy savings can be obtained from the corresponding short description in addition to the common technical data.

32115 (NP—2901002) Ordinance on energy-saving thermal insulation of buildings. Thermal Insulation Ordinance (Waermeschutz V). Dated from August 11, 1977. (Bundesministerium fuer Wirtschaft, Bonn (Germany, F.R.)). Aug 1977. 32p. (In German). NTIS (US Sales Only), PC A03/MF A01. Order Number DE82901002.

Full text of the Thermal Insulation Ordinance, including supplementary regulations and tables of heat transmission coefficients of components.

32116 (SERI/TP—254-1482) Comparison of heat pump water heaters and solar domestic water heaters. Morrison, L.S.; Claridge, D.E. (Solar Energy Research Inst., Golden, CO (USA)). Dec 1981. Contract AC02-77CH00178. 6p. (CONF-820112—1). NTIS, PC A02/MF A01. Order Number DE82006117.

From Semiannual meeting of the American Society of Heating, Refrigerating, and Air Conditioning Engineers; Houston, TX, USA (24 Jan 1982).

The heat pump water heater (HPWH) is described and life-cycle cost analyses are presented for the HPWH and the solar domestic water heater. (MHR)

32117 **Cost comparison of several heating systems.** Nitsche, A. *Landtechnik;* **36**: No. 3, 151-152(Mar 1981). (In German).

Energy cost reduction implies for the building owner and the planner first of all to choose the appropriate heat production system for heating the living zone. Cost comparisons are likely to provide important decision aids for that choice.

32118 **(PB—82-143611) Heat pump operating with a mixture of fluids. Final report.** Rojey, A.; Meyer, C.; Choffe, B.; Jacq, J.; Asselineau, L. (Institut Francais du Petrole (IFP), 92 - Rueil-Malmaison). 1980. D; See also French report EUR-6848-FR. 120p. NTIS, PC A06/MF A01.

The coefficient of performance of a heat pump system comprising an external heat exchange medium may be increased if a non-azeotropic mixture of hydrocarbons or freons as working fluid is used so that it vaporizes or condenses with a change in temperature of the external fluid, i.e., the heat exchange medium. The aim of the research project was the selection of suitable mixtures and the investigation of their properties, the study of the operation of a heat pump using such mixtures by means of a mathematical model and experimental tests, as well as by a technico-economic analysis of actual applications in domestic heating systems and in the industrial sector.

3202 Transportation

REFER ALSO TO CITATION(S) 32090

32119 **(NP—2900604) Interplay between urban pattern, traffic, and energy consumption. Report 1. The traffic behaviour.** (Danmarks Tekniske Hojskole, Lyngby. Lab. for Energiteknik). Apr 1980. 145p. (In Danish). NTIS (US Sales Only), PC A08/MF A01. Order Number DE82900604.

Some empirical investigations have been made concerning the interplay between urban patterns and some traffic patterns. The analysis gives some figures on car owners, frequency of drives, and distance of the drives. The figures are on specially the local and regional passenger trafic. This part 1 of the report is the basis for the calculations in part 2 on energy consumption of traffic.

32120 **(NP—2900605) Interplay between urban pattern, traffic, and energy consumption. Report 2. The energy consumption of passenger traffic.** (Anders Nyvig A/S, Hoersholm, Denmark). Jul 1980. 65p. (In Danish). NTIS (US Sales Only), PC A04/MF A01. Order Number DE82900605.

Based on the investigations in part 1 the structure of the energy consumption in traffic is analysed. The energy efficiency (the specific energy consumption) of the passenger transport are calculated. Some specific factors of the energy consumption are analysed to evaluate the probable development and possibilities of conservation. These factors are : technological requirements, standard of the vehicles, the utilization of vehicles, the pattern of traffic, the volume of passenger transport, choice of means of transport. Specially the volume of passenger transport and its distribution on the different means of transport, but also the traffic pattern and the utilization of vehicles are factors that depend on the urban patterns. These factors also depend on socio-economic and traffic-political developments.

3203 Industry And Agriculture

REFER ALSO TO CITATION(S) 31727, 32073, 32110, 32115, 32118, 32313, 32497

32121 **(DOE/CS/20295—1) Reducing energy cost in the Scrap Iron and Steel Industry.** (XENERGY, Inc., Burlington, MA (USA)). 1981. Contract AC01-79CS20295. 59p. NTIS, PC A04/MF A01. Order Number DE82006010.

The handbook presents ideas and techniques for energy conservation in the scrap iron and steel processing industry. The economics of the energy saved is also discussed. Case studies are analyzed to illustrate: specific savings in electricity and processing costs, management of energy costs of the vehicle fleet and the reduction of heating and lighting costs. Capital investments that provide significant returns on investment dollars are discussed. (MCW)

32122 **(DOE/ET/20618—T1) Economics and operating characteristics of various materials-handling systems and wood fuels in small- to medium-sized boilers. Final report.** Levi, M.P.; Bradfield, J.; Elliott, R.N.; Holman, W.E.; O'Grady, M.J. (North Carolina State Univ., Raleigh (USA). School of Forest Resources). 1980. Contract FG01-78ET20618. 122p. NTIS, PC A06/MF A01. Order Number DE82004905.

The objectives of this project were to study the cost and operating characteristics of various wood energy systems and to develop guidelines for the design for such systems. Emphasis was placed on whole-tree chips (WTC), and wood pellet fuels. The project evaluates the economics and some of the handling and burning characteristics of whole-tree chips burned in two commercial boilers designed to burn bark and refuse respectively, and of wood pellets burned in a small stoker-fed coal boiler; investigates the effect of storage conditions on the quality of pellets produced from southern pine; and develops guidelines to help plant managers, engineers, and other decision-makers become more familiar with wood energy systems.

32123 **Energy use in three sectors of the electrical-engineering industry.** London, England; Department of Industry (1982). 24p. (NP—2903288). Dept. of Industry, Ashdown House, 123 Victoria Street, London SW1E 6RB, England.

Portions of document are illegible.

The use of energy in three sectors of the electrical engineering industry; gramophone records and tape recordings, receiving and sound reproducing equipment and radio, radar and electronic capital goods - is based on one-day visits made to and information obtained from 63 sites whose total energy consumption in 1978 was 1.8 PJ. The energy consumption of all the firms in the three sectors is estimated to be 6.7 PJ for that year. The proportions of the various fuels used was different in the three sectors, but the proportion of energy supplied as electricity was never more than one quarter. The cost of delivered energy was 5 per cent of the cost of manufacturing records and tapes, 2 per cent of the cost of making receiving and sound reproducing equipment and 1 1/2 per cent of the cost of making radios, radar systems and electronic capital goods. Wide variations between sites were found in the ratios of annual energy consumption to the number of employees and to the product of floor area and hours worked. However, the energy consumed per employee in the manufacture of records and tapes was nearly an order of magnitude larger than in the other sectors. Two-fifths of all the opportunities for saving energy concerned space heating, one-fifth concerned boiler plant and a further one-fifth concerned factory services. Lighting and manufacturing each provided one-tenth of the opportunities.

32124 **Investigation of power consumption, suspension and flooding characteristics of stirred, aerated slurry reactors.** Wiedmann, J.A.; Steiff, A.; Weinspach, P.M. *German Chemical Engineering (English Translation);* **3**: No. 5, 303-312(Oct 1980).

From Annual meeting of chemical engineers. 219. meeting of the European Federation of Chemical Engineering; Nuernberg, Germany, F.R. (26 - 28 Sep 1979).

Experimental investigations on power consumption, suspension and flooding characteristics of gas-solid-liquid systems were conducted in a stirred, aerated slurry reactor, with liquid forming the continuous phase, and gas as well as solids being dispersed. Two geometrically similar vessels equipped with baffles were employed, while turbine and propeller mixers served as agitating devices and air was continuously dispersed through gassing tubes, sparger rings or porous sintered plates. Four experimental liquids, differing significantly in viscosity and surface tension, and three types of solid particles of different diameters and in varying concentrations were used. Measurements with previously employed

material systems show that the required stirring power in the entire suspension zone increases with increasing solids hold-up and superficial gas velocity.

3206 Municipalities And Community Systems

REFER ALSO TO CITATION(S) 32076, 32095, 32102, 32121, 32465

3209 Education And Public Relations

32125 (DOE/IR/10905—20) Energy education programs. (Minnesota Environmental Sciences Foundation, Inc., Minneapolis (USA); Midwest Energy Education Consortium, St. Paul, MN (USA)). 1981. Contract FG02-80IR10905. 58p. NTIS, PC A04/MF A01. Order Number DE82004904.

This inventory of educational programs consists of a list of reports and inventories of educational programs; a list of periodicals and newsletters; a short list of general information resources; and a section of annotated program descriptions, submitted by educators. The annotated program descriptions are divided into Youth Programs, Adult/Post-Secondary Programs, and Teacher Programs.

33 ADVANCED AUTOMOTIVE PROPULSION SYSTEMS

3301 Internal Combustion Engines

32126 (NP—2901109) Simulation of a two-cycle engine and optimization of its gas-dynamic parameters of influence by means of a direct research method. Heine, P. (Bochum Univ. (Germany, F.R.). Abt. Maschinenbau und Konstruktiven Ingenieurbau). 6 Jun 1979. 143p. (In German). NTIS (US Sales Only), PC A07/MF A01. Order Number DE82901109.

Thesis.

In this paper a system of computer codes is described by means of which a detailed mathematical simulation of crankcase-flushed two-cycle engines is possible, including the unsteady flow phenomena in the connected piping systems. The code system is based on two models: a model for the pipe flow and a model for the flow through the throtling places built into the seal pipe systems of two-cycle engines. The aim of the development of this system of computer codes and this paper was among other things to calculate the effects of variations in the design parameters, in order to achieve better understanding of the physical phenomena and, as a result of the gas-dynamic processes, improve the design. As an example of parameter studies matching of a real engine is discussed.

3303 Electric-powered Systems

REFER ALSO TO CITATION(S) 31742

32127 (ANL/OEPM—81-7) Solid-state high common-mode battery cell voltage scanner: design report. Swoboda, C.A.; Cannon, P.H.; Hornstra, F.; Kmiec, R.J.; Yao, N.P. (Argonne National Lab., IL (USA)). Nov 1981. Contract W-31-109-ENG-38. 38p. NTIS, PC A03/MF A01. Order Number DE82007032.

The characterization or testing of full-size electric-vehicle batteries using a computerized data acquisition system (DAS) poses three major problems. The first problem is one of discrimination. Common-mode voltages approaching 300 V are routinely encountered and must be safely rejected by the DAS while it is accurately recording individual cell voltages, which are low in comparison to common-mode voltages. The second problem involves reduction of the data collected, and the third concerns protection of the battery under test. The continuous-scan solid-state instrument described in this report addresses these problems. The micro-processor-based instrument, which is interfaced to a computer automated measurement and control (CAMAC) system, has the ability to reject common-mode voltages of up to 300 V. It incorporates data-reduction algorithms to minimize the amount of data passed to a central computer through the CAMAC system. This data-reduction feature also simplifies statistical cell studies by providing (1) minimum and maximum cell voltages, (2) identification of cells producing the minimum and maximum voltages, and (3) the average and the standard deviation of the cell voltages. The instrument provides battery system protection by comparing the individual cell voltages to preset minimum and maximum limits and signaling any deviations. The scanner can be programmed to signal any cell voltage irregularity or to automatically terminate the testing should deviations occur.

32128 (DOE/CS/51213—T20) Near-term electric-vehicle program. Phase II. Mid-term review summary report. (AiResearch Mfg. Co., Los Angeles, CA (USA)). 27 Jul 1978. Contract AC03-76CS51213. 226p. NTIS, PC A11/MF A01. Order Number DE82005412.

The general objective of the Near-Term Electric Vehicle Program is to confirm that, in fact, the complete spectrum of requirements placed on the automobile (e.g., safety, producibility, utility, etc.) can still be satisfied if electric power train concepts are incorporated in lieu of contemporary power train concepts, and that the resultant set of vehicle characteristics are mutually compatible, technologically achievable, and economically achievable. The focus of the approach to meeting this general objective involves the design, development, and fabrication of complete electric vehicles incorporating, where necessary, extensive technological advancements. A mid-term summary is presented of Phase II which is a continuation of the preliminary design study conducted in Phase I of the program. Information is included on vehicle performance and performance simulation models; battery subsystems; control equipment; power systems; vehicle design and components for suspension, steering, and braking; scale model testing; structural analysis; and vehicle dynamics analysis. (LCL)

32129 (DOE/CS/54209—4) Vehicle test report: Electric Vehicle Associates electric conversion of an AMC Pacer. Price, T.W.; Wirth, V.A. Jr.; Pompa, M.F. (Jet Propulsion Lab., Pasadena, CA (USA)). 15 Oct 1981. Contract AI01-78CS54209. 60p. NTIS, PC A04/MF A01. Order Number DE82005811.

The EVA Change of Pace, an electric vehicle assembled by Electric Vehicle Associates of Cleveland, Ohio was tested at the Jet Propulsion Laboratory's (JPL) dynamometer facility in Pasadena and at JPL's Edwards Test Station, located near Lancaster, California. The tests were conducted between 28 August and 7 December 1979. These tests were performed to characterize certain parameters of the EVA Pacer and to provide baseline data that can be used for the comparison of improved batteries that may be incorporated into the vehicle at a later time. The vehicle tests were concentrated on the electrical drive subsystem; i.e., the batteries, controller and motor. The tests included coastdowns to characterize the road load, and range evaluations for both cyclic and constant speed conditions. A qualitative evaluation of the vehicle's performance was made by comparing its constant speed range performance with those vehicles described in the document titled State of the Art Assessment of Electric and Hybrid Vehicles. The Pacer performance was approximately equal to the majority of the vehicles tested in that 1977 assessment.

3305 Flywheel Propulsion

32130 (LA-UR—81-3071) Impact of flywheel-energy-storage technology upon taxicab fleet operation in a large metropolitan city. Krupka, M.C.; Jackson, S.V. (Los Alamos National Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 12p. (CONF-811212—2). NTIS, PC A02/MF A01. Order Number DE82002371.

From 4. international conference on alternative energy sources; Miami Beach, FL, USA (14 Dec 1981).

The incorporation of flywheel energy storage systems (FESS) into automotive vehicles has been under consideration for some time. Previous studies have suggested that FESS can yield substantial benefits in automotive vehicle operation, particularly for urban driving. An assessment of the impacts resulting from incorpo-

ration of FESS into automotive fleets in a large metropolitan city is described. Specifically, the case of taxicab fleet operation within New York City is examined. Unique features of taxicab fleets are noted and taxicab operational characteristics within New York City are detailed. Based upon available New York City operational data, a levelized life-cycle cost comparison between a standard internal combustion engine vehicle (ICEV) in present use as a taxicab and a projected FESS/ICEV taxicab is generated. Energy-savings and environmental benefits are discussed, and potential institutional barriers to FESS implementation are identified. The results obtained from this study generally emphasize the value of incorporating flywheel energy storage systems into future vehicles designed for taxicab use.

3306 Vehicle Design Factors

32131 **(DOE/NASA/0124—6) Small passenger car transmission test: Chevrolet Malibu 200C transmission with lockup.** Bujold, M.P. (National Aeronautics and Space Administration, Cleveland, OH (USA). Lewis Research Center; Eaton Engineering and Research Center, Southfield, MI (USA)). Aug 1981. Contract AI01-77CS51044. 256p. (NASA-CR—165182; ERC-TR—8125). NTIS, PC A12/MF A01. Order Number DE82010113.

The small passenger car transmission test was initiated to supply electric vehicle manufacturers with technical information regarding the performance of commercially available transmissions. This information would enable EV manufacturers to design a more energy efficient vehicle. With this information the manufacturers would be able to estimate vehicle driving range as well as speed and torque requirements for specific road load performance characteristics. This report covers the 1980 Malibu 200C automatic transmission with lockup. This transmission was tested per a passenger car automatic transmission test code (SAE J651b) which required drive performance, coast performance, and no load test conditions. Under these test conditions the transmission attained maximum efficiencies in the 95% range for drive performance tests. The major results of this test are the torque, speed and efficiency curves which are located in the data section of this report. These graphs map performance characteristics for the Malibu 200C transmission.

36 MATERIALS

3601 Metals And Alloys

REFER ALSO TO CITATION(S) 31752, 31800, 31907, 31908, 31909, 31916, 31978, 31986, 32017, 32260, 32295, 32764, 32819, 32820, 32824, 32844, 32886

32132 **(BDX—613-2730) Molybdenum and its analyses.** Hale, G.M. (Bendix Corp., Kansas City, MO (USA)). Jan 1982. Contract AC04-76DP00613. 63p. NTIS, PC A04/MF A01. Order Number DE82007645.

The physical and chemical properties of molybdenum are examined, and numerous analytical methods are considered in search of an optimum qualitative test for detecting Mo or its principal alloy TZM in concentrations as low as 0.1 μg in 10 ml of solvent, a dilution of 1:100,000,000. A zinc xanthate chemical spot test is recommended as an inexpensive, convenient, and sensitive test, with a detection limit of 0.01 μg Mo per drop of acid test solution.

32133 **(CBPF-A—0017/80) ns-ms excitation of alkali atoms in the Glauber approximation.** de Barros, H.G.deP.L.; Brandi, H.S. (Centro Brasileiro de Pesquisas Fisicas, Rio de Janeiro). May 1980. 16p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700077.

An expression for the scattering amplitude in the Glauber approximation for ns-ms electronic excitation of alkali atoms is obtained. The interaction potential between the incident electron, the core electrons and N-1 protons is approximated by an appropriate spherical potential.

32134 **(CBPF-A—0021/80) Induced magnetism via conduction electron exchange; application to $PrAl_3$.** Palermo, L.; da Silva, X.A. (Centro Brasileiro de Pesquisas Fisicas, Rio de Janeiro). Jul 1980. 12p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700086.

The magnetization, susceptibility and magnetic specific heat of $PrAl_3$ versus temperature are studied within a model where the onset of magnetism is due to mutual magnetization of the rare-earth ions and the conduction electrons, the ionic magnetization process being van Vleck-like. The crystal field, bandwith and exchange parameters of the model which fit the available experimental data are 2.5 meV, 7000 meV and 341 meV, respectively.

32135 **(DOE/ER/02313—11) Ferrous alloy metallurgy - liquid-lithium corrosion and welding. Progress report, January 1, 1981-December 31, 1981.** Olson, D.L.; Matlock, D.K. (Colorado School of Mines, Golden (USA)). 1981. Contract AS02-76ER02313. 68p. NTIS, PC A04/MF A01. Order Number DE82005306.

The effects of liquid lithium on the corrosion and mechanical behavior of ferrous alloys in liquid lithium are being investigated. The frequency dependent fatigue-crack-propagation characteristics of 2 1/4 Cr-1 Mo steel and types 304 and 304L stainless steel shows that liquid lithium enhances fatigue crack growth rates in the temperature range of 473°K to 973°K. A mechanistic interpretation of the effects of lithium indicates that lithium enhances crack growth by inducing embrittlement at low temperatures and by grain boundary penetration at high temperatures. The high temperature corrosion characteristics of 304L stainless steel in low nitrogen liquid lithium have shown that corrosion results in the two-stage development of a ferrite layer. The welding research program is considering the variables which influence the microstructural, mechanical, and thermal expansion properties of dissimilar metal weldments.

32136 **(DOE/ER/04861—3) Prediction of the behavior of structural materials under irradiation through modeling of the microstructure. Progress report, November 1, 1980-October 31, 1981. Final report.** Wolfer, W.G. (Wisconsin Univ., Madison (USA). Dept. of Nuclear Engineering). Oct 1981. Contract AS02-78ER04861. 9p. NTIS, PC A02/MF A01. Order Number DE82004897.

The research carried out over the period of about three years falls into three categories: effects of point-defect interactions on the formation of voids, dislocation loops, and network dislocations, during irradiation, and the consequences on the mechanical properties of structural materials; the development of a new mathematical tool to describe the evolution of systems far from a thermodynamic equilibrium state; and the development and exploration of a new technique to measure mechanically and non-destructively the creep damage, or the grain-boundary cavity formation, which is the cause of high-temperature stress rupture.

32137 **(DOE/ER/10107—3) Microstructure of rapidly solidified Al_2O_3-dispersion-strengthened Type 316 stainless steel.** Megusar, J.; Arnberg, L.; Vander Sande, J.B.; Grant, N.J. (Massachusetts Inst. of Tech., Cambridge (USA)). 1981. Contract AS02-78ER10107. 5p. (CONF-810831—78). NTIS, PC A02/MF A01. Order Number DE82003870.

From Fusion reactor materials meeting; Seattle, WA, USA (9 Aug 1981).

An aluminum oxide dispersion strengthened 316 stainless steel was developed by surface oxidation. Surface oxidation was chosen as a preferred method in order to minimize formation of less stable chromium oxides. Ultra low C+N 316 stainless steel was alloyed with 1 wt % Al, rapidly solidified to produce fine powders and attrited to approximately 0.5 μm thick flakes to provide for surface oxidation. Oxide particles in the extruded material were identified mostly as Al oxides. In the preirradiated condition, oxide dispersion retarded crystallization and grain growth and had an effect on room temperature tensile properties. These structural modifications are expected to have an effect on the swelling resistance, structure stability and high temperature strength of austenitic stainless steels (Path A alloys).

32138 **(DOE/ER/10107—4) Pre-irradiation spatial distribution and stability of boride particles in rapidly solidified boron-doped stainless steels.** Kanani, N.; Arnberg, L.; Harling, O.K. (Massachusetts Inst. of Tech., Cambridge (USA)). 1981. Contract AS02-78ER10107. 5p. (CONF-810831—77). NTIS, PC A02/MF A01. Order Number DE82003871.

From Fusion reactor materials meeting; Seattle, WA, USA (9 Aug 1981).

The time temperature behavior of boride particles has been studied in rapidly solidified ultra low carbon and nitrogen modified 316 stainless steel with 0.088% boron and 0.45% zirconium. The results show that the as-splat-cooled specimens exhibit precipitates at the grain boundaries and triple junctions. For temperatures up to about 750°C no significant microstructural changes occur for short heat treatment times. In the temperature range of 750 to 950°C, however, particles typically 100 to 500 A in diameter containing Zr and B are formed within the grains. Higher temperatures enhance the formation of such particles and give rise to particle networks. The results show that a fine and uniform distribution of the boride particles almost exclusively within the grains can be achieved if proper annealing conditions are chosen. This type of distribution is an important requirement for the homogeneous production of helium during neutron irradiation in fast reactors.

32139 **(DOE/ER/10107—5) Mechanical properties and structure of rapidly solidified high-titanium-stabilized 316 stainless steel.** Testart, E.; Megusar, J.; Arnberg, L.; Grant, N.J. (Massachusetts Inst. of Tech., Cambridge (USA)). 1981. Contract AC02-78ER10107. 5p. (CONF-810831—70). NTIS, PC A02/MF A01. Order Number DE82006758.

From Fusion reactor materials meeting; Seattle, WA, USA (9 Aug 1981).

Prime Candidate Alloy (PCA) has been rapidly solidified and its composition has been modified by increasing carbon and titanium content. Rapidly solidified Path A alloy, with a fine grain size (approximately 5 μm) and controlled TiC dispersion, showed good room temperature tensile properties and favorable rupture strength and ductility at 923 K in the preirradiated condition. Structural modifications which include a reduction of grain size, an increase in TiC content and a control of dislocation structure are expected to have a beneficial effect on high temperature strength and swelling of Path A alloys under irradiation.

32140 **(DOE/ER/10107—7) Microstructure of rapidly solidified Path A prime-candidate alloys following irradiation with Fe and He ions.** Arnberg, L.; Vander Sande, J.B.; Frost, H.J.; Harling, O.K. (Massachusetts Inst. of Tech., Cambridge (USA)). 1981. Contract AS02-78ER10107. 5p. (CONF-810831—76). NTIS, PC A02/MF A01. Order Number DE82006756.

From Fusion reactor materials meeting; Seattle, WA, USA (9 Aug 1981).

A rapidly solidified, titanium modified, cold worked Type 316 stainless steel has been irradiated simultaneously with Fe and He ions at temperatures between 450 and 650°C. The material shows no void swelling at 450°C even at 50 dpa. At 550°C the swelling is very low below 40 dpa (< 0.01%) but increases with fluence to 0.4% at 60 dpa. At 650°C both the cavity number density and size increase to give a swelling of 0.8% at 40 dpa. A conventionally ingot cast alloy with the same composition shows comparable swelling but the void number density in this material is significantly higher. Small (< 200 A) TiC particles which were originally present in the rapidly solidified material are dissolved at fluences above 40 dpa at all temperatures. A silicon and nickel rich phase has precipitated during irradiations at 550 and 650°C.

32141 **(DOE/ER/10107—9) Application of high-strength copper alloys for a fusion-reactor first wall.** Harling, O.K.; Yu, G.P.; Grant, N.J.; Meyer, J.E. (Massachusetts Inst. of Tech., Cambridge (USA)). 1981. Contract AS02-78ER10107. 6p. (CONF-810831—72). NTIS, PC A02/MF A01. Order Number DE82006754.

From Fusion reactor materials meeting; Seattle, WA, USA (9 Aug 1981).

High strength copper alloys can be produced by advanced powder metallurgical processes. These materials are considered for application as primary structural alloys in fusion reactors. Comparisons are made, for relevant properties, with other candidate structural alloys such as austenitic stainless steel and refractory alloys. Advanced copper alloys are sufficiently attractive to warrant further consideration for the fusion reactor application.

32142 **(DOE/ER/10389—2) Influences of gaseous environment on low-growth-rate fatigue-crack propagation in steels. Final report.** Ritchie, R.O.; Suresh, S.; Toplosky, J. (Massachusetts Inst. of Tech., Cambridge (USA). Dept. of Mechanical Engineering; Lawrence Berkeley Lab., CA (USA)). Sep 1981. Contract AS02-79ER10389. 93p. (LBL—13421). NTIS, PC A05/MF A01. Order Number DE82006304.

Lower strength steels have traditionally been considered to be immune to embrittlement in the presence of hydrogen gas. In this work, it is demonstrated that contrary to conventional wisdom, there are two regions of fatigue crack growth where hydrogen gas causes significant accelerations in crack propagation rates compared to air. Environmental influences in these two regimes are shown to be dominated by entirely different mechanisms. Such results in lower strength steels are compared with corrosion fatigue crack growth behavior in ultrahigh strength steels. It is noted that although oxide-induced crack closure concepts still are valid, the effect is minimized in higher strength alloys and behavior is dominated at both near-threshold and higher growth rates by hydrogen embrittlement mechanisms. The consequences of this work are examined in the light of the role of environment, microstructure, load ratio and strength level in influence ultralow growth rate fatigue crack propagation behavior in steels.

32143 **(DOE/ER/10556—86) Investigation of the tensile deformation and fracture of a dual-phase steel.** Szewczyk, A.F. (Brown Univ., Providence, RI (USA)). Nov 1981. Contract AC02-80ER10556. 65p. NTIS, PC A04/MF A01. Order Number DE82007522.

An analysis of the tensile deformation and fracture of a commercial dual-phase steel was conducted with emphasis on the roles that the individual phases have in these processes. It was observed that the deformation of ferrite is somewhat inhomogeneous, as suggested by the nonuniform appearance of slip lines in ferrite grains. The plastic deformation of martensite, as determined by changes in the particles' average aspect ratio, was found to be appreciable only at strains much higher than the uniform strain to necking. The mechanism of failure was one of void formation, growth and coalescence. Void formation was observed to most frequently occur between the poles of two closely-spaced martensite particles situated on ferrite grain boundaries.

32144 **(FEI—1046) Long-term strength of Kh13M2S2 in biaxial stressed state.** Pykhtin, V.M. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Obninsk. Fiziko-Ehnergeticheskij Inst.). 1980. 15p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700267.

Long-term strength of thin-walled tubular and plane samples of Kh13M2S2 steel at 650 deg C was studied. The tubular samples were loaded with internal gas pressure which resulted in a biaxial stressed state, the plane ones were loaded with uniaxial extension. Statistical processing of the experimental results was carried out, the straight lines of long-term strength with confidence intervals were plotted. Of four studied criteria of the complex stressed state the best coincidence of the experimental results under biaxial and uniaxial load is obtained using the Lebedev criterion.

32145 **(FEI—1113) Investigation into carbon diffusion in multicomponent iron alloys with chromium, nickel, molybdenum and niobium in the range of γ-solid solutions.** Pavlinov, L.V. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Obninsk. Fiziko-Ehnergeticheskij Inst.). 1980. 11p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700268.

The effect of chromium, nickel, molybdenum, and niobium on carbon diffusion in iron alloys with 15-20% Cr, 15-20% Ni, 0-2% Mo, and 0-1% Nb in the range of γ solid solutions is studied by the method of planning the total factor experiment. The diffusion

coefficients are determined using the numerical version of the method of integral residue and ^{14}C radioactive isotope at 600, 700, 800 deg C. It is shown that the value of the carbon diffusion coefficient is essentially influenced by chromium concentration variation: increasing the chromium concentration from the average (17.5%) to the upper (20%) level leads to reduction of the carbon diffusion coefficient approximately by 13%. The nickel effect on the carbon diffusion parameters, noticeable at 600 deg C, decreases with the temperature increase. The molybdenum and niobium effect, on the contrary, becomes more noticeable at relatively high temperatures (800 deg C). The effect of chromium, nickel, molybdenum, and niobium on the carbon diffusion parameters is not additive.

32146 **(FEI—1145) Impurities diffusion in binary titanium-zirconium and titanium-aluminium alloys in a bcc solid-solution range.** Pavlinov, L.V. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Obninsk. Fiziko-Ehnergeticheskij Inst.). 1980. 14p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700269.

Uranium diffusion in zirconium double alloys with 10; 20; 30; 40; 50; 60; 70; 80 and 90 at.% zirconium and with 5, 10, 15, 20, 25 and 30 at.% aluminium is studied. Diffusion coefficients have been determined using the method of the integral residue with the help of ^{235}U isotope α-irradiation at the temperatures 900-1200 deg C (Ti-Zr alloys) and 1100-1400 deg C (Ti-Al alloys). It is shown that activation energy over all concentration range from 0 to 100% Zr does not depend on the alloys composition. Diffusion coefficients during mutual alloying of titanium and zirconium increase and reach the maximum at 20-40 at.% Zr. Titanium alloying with aluminium up to 10 at.% leads to the increase in activation energy. The results obtained are considered from the viewpoint of diffusion regularities in bcc metals with polymorphic transformations.

32147 **(FEI—1149) Electric conductivity of titanium, zirconium, hafnium and its alloys. Communication 1.** Rudnev, I.I.; Solov'ev, V.A. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Obninsk. Fiziko-Ehnergeticheskij Inst.). 1980. 19p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700270.

Results of measurement of the electric conductivity in titanium, zirconium, hafnium and zirconium-titanium and zirconium-scandium alloys are presented. Polynomial mathematical dependences, describing with a good accuracy temperature dependences of these metals electric conductivity in the limits of α-phase are built according to the experimental data.

32148 (GSI—81-2, pp 175) **Corrosion of ion bombarded metals studied by neutron activation analysis.** Santosa, S.; Ferber, H.; Froeschen, W.; Wolf, G.K. Mar 1981. NTIS (US Sales Only), PC A16/MF A01.

In Scientific report 1980.

32149 **(IAE—3338/10) Study of the tunnel junctions on vanadium base.** Tsetlin, M.B. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Atomnoj Ehnergii). 1980. 21p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700140.

The V-I-Pb tunnel junctions, where vanadium oxide, carbon and silicon are used as a barrier material, are studied. Characteristics of the V-Si-Pb junctions are close to the ideal ones in the V >= (Δsub(V) + Δsub(Pb))/e voltage range and give the ratio 2Δsub(V)(O)/kTsub(c) 3.5 +- 0.1 consistent with the Bardin-Cooper-Shriffer theory, (where Δsub(V) - vanadium energy gap, Δsub(Pb) - lead energy gap, Tsub(c) - critical temperature). In the rest cases this ratio is lesser. Peculiarities connected with the peaks in the vanadium phonon spectrum do not reveal in the V-Si-Pb junction characteristics that can be explained using the hypothesis about "a thin normal layer" existing on the vanadium surface. The characteristics of all junctions have anomalies indicating the fact, that there exists suppression of the superconducting properties of the vanadium film near-surface layers. This suppression is most strongly expressed in oxidic junctions, and it weakly affects the V-Si-Pb junction characteristics. In the case of the V-Si-Pb tunnel junctions the tunnel characteristics anomalies and absence of the phonon peculiarities qualitatively agrees with the model assuming existence of the thin normal layer, which thickness is more less than the coherency length and comparable with the interatomic distance.

32150 **(INIS-mf—6793) Manufacture of high purity steel. 2. National conference.** (Skoda, Plzen (Czechoslovakia). Zavodni Pobocka Ceske Vedeckotechnicke Spolecnosti). Apr 1981. 64p. (In Czech). (CONF-8104139—). NTIS (US Sales Only), PC A04/MF A01. Order Number DE82780195.

From 2. national conference on manufacture of high purity steel; Pizen, Czechoslovakia (13 Apr 1981).

Separate abstracts have been prepared for items within scope for inclusion in the Energy Data Base.

32151 **(INIS-mf—6830) FIM-atom probe investigation of the bainite transformation in CrMo steel.** Bach, P.W. (Technische Hogeschool Twente, Enschede (Netherlands)). 2 Jul 1981. 100p. NTIS (US Sales Only), PC A05/MF A01. Order Number DE82780187.

Thesis.

To obtain a better understanding of the role played by Cr and Mo in the bainite transformation a Field-Ion Microscope - Atom Probe was constructed in order to study the distribution of the alloying elements near various types of boundaries on atomic scale. The distribution of alloying elements measured with this instrument is not so smooth on atomic scale as suggested by microprobe analysis. In a coherent twin boundary, formed during the bainite transformation, a depletion of the substitutionals Cr and Mo and an enhancement of the C content is observed, which is in accordance with the atomic model of a B.C.C. twin. In the twin plane the interstitial sites are even larger than the F.C.C. octahedral sites and this plane can act as an effective sink for the carbon atoms from bainitic ferrite. The depletion of Cr and Mo from the twin plane is due to interface coherency. (Auth.).

32152 **(INIS-SU—61) Proceedings of the 7. Bakurianian school on radiation physics of metals and alloys.** (AN SSSR, Moscow. Nauchnyj Sovet po Probleme Radiatsionnaya Fizika Tverdogo Tela; AN Gruzinskoj SSR, Tbilisi. Inst. Fiziki). 1979. 137p. (In Russian). (CONF-790278—). NTIS, PC A07/MF A01. Order Number DE82780223.

From 7. Bakurianian school on radiation physics of metals and alloys; Bakuriani, USSR (Feb 1979).

Individual items in scope for the data base were processed separately. (DLC)

32153 **(IWGRRPC—79/4) Analysis of the behavior of advanced reactor pressure vessel steels under neutron irradiation. IAEA co-ordinated research programme.** (International Atomic Energy Agency, Vienna (Austria). International Working Group on Reliability of Reactor Pressure Components). Dec 1979. 179p. (CONF-7903161—). NTIS (US Sales Only), PC A09/MF A01. Order Number DE82780038.

From 2. research co-ordination meeting on analysis of the behaviour of advanced reactor pressure vessel steels under neutron irradiation; Vienna, Austria (1 Mar 1979).

Individual papers were processes separately for the data base. (DLC)

32154 **(JINR-R—14-81-177) Study of hyperfine magnetic fields on the impurity of Sm in Fe and Ni ferromagnetic lattices.** Budzynski, M.; Deryuga, V.A.; Zhuk, V. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Problems). 1981. 14p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700097.

From 31. Conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (1981).

The dependence of effective magnetic field anti H affecting the impurity nuclei of ^{152}Sm in iron and nickel matrixes on the conditions of sample thermal treatment has been investigated by the integral perturbative angular correlation (IPAC) method. The measurements have been made at room temperature. The number of nuclei f which are under the influence of hyperfine magnetic field are defined. It is shown that quantity anti H and the number of

nuclei which are under the influence of H field decreases with the growth of annealing temperature iron. The difference in the values of the field obtained from IPAC 1408-122, 1112-122 keV cascades and from 868-244 keV cascade in ^{152}SmNi is explained by attenuation of the angular correlation factor due to dynamic, magnetic and, possibly, static electric quadrupole interactions. The values of hyperfine magnetic field, H=2600/400/kGs and H=660/95/kGs for SmFe and SmNi, respectively, are defined by taking into account the attenuation of the angular correlation factor and f parameter.

32155 (KFTI—81-15) Influence of the grain size on the characteristics of high-temperature plastic deformation of beryllium. Karpov, E.S.; Papirov, I.I.; Tikhinskii, G.F. (AN Ukrainskoj SSR, Kharkov. Fiziko-Tekhnicheskij Inst.). 1981. 14p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700271.

The dependences of yield point of polycrystalline beryllium with the grain size of 10, 36, 100 μm on temperatures varied in the 600-800 deg C range and deformation rates of $1.1x10^{-5}$-$1.1x10^{-1}$ s^{-1} are investigated. Dependences of stresses on temperature deformation rate and grain size are plotted. The parameters of speed sensitivity of flow stress and activation energy in beryllium with different grain size in a broad field of experimental conditions are determined. Maps of mechanism of beryllium plastic deformation are plotted and some anomalies of its behaviour at high temperatures are elucidated.

32156 (LBL—13623) Optical absorption spectroscopy of molecules adsorbed on Ni(111) and energy transfer from the ^{3}eta π^* state of pyrazine to Ni(111) and Ag(111) surfaces. Robota, H.J. (Lawrence Berkeley Lab., CA (USA)). Nov 1981. Contract W-7405-ENG-48. 171p. NTIS, PC A08/MF A01. Order Number DE82005803.

Thesis.

Changes in the optical response of a Ni(111) surface as a result of adsorption of molecules is measured with a spectroscopic rotating analyzer ellipsometer. For the molecules pyridine, pyrazine, and naphthalene condensed onto the nickel surface at low temperature, the changes in optical response can be described with a dielectric model which treats the adsorbed phase as a separate continuous medium of well-defined thickness and complex refractive index. For annealed layers less than 100 A thick, the absorption coefficient corresponds well with the known optical absorption spectrum of these molecules. When a wide variety of molecules are chemisorbed onto the Ni(111) surface, the modification of the optical response can no longer be described by considering the optical properties of the adsorbate alone. Rather, every molecule studied revealed a single broad absorption maximum at 4.2 eV.

32157 (NP—2901084) High-temperature corrosion of ferritc chromium steels and austenitic chromium-nickel steels in atmospheres containing hydrogen sulphide. Grosser, W. (Erlangen-Nuernberg Univ., Erlangen (Germany, F.R.). Technische Fakultaet). 21 Dec 1979. 180p. (In German). NTIS (US Sales Only), PC A09/MF A01. Order Number DE82901084.

Thesis.

The corrosive behaviour of ferritic chromium steels (0.8 to 24 wt.% chromium) and austenitic chromium-nickel alloys (8 to 41 wt.% nickel) was investigated using gravimetric measuring methods in flow apparatus under a pressure of 1 bar in atmospheres containing hydrogen sulphide. The kinetics of the layer growth on steels can be represented by a simple mathematical relationship. The sulphide formation does not take place uniformly according to a linear or parabolic time law, it is influenced by many parameters. The temperature dependence on the reaction rate can hence be described by an average apparent activation energy of about 75 kJ/mol. The flow rate of the reaction gas does not have any influence on the layer growth after a certain minimum size. The formation rate of the sulphide layers however depends on the third root of the hydrogen sulphide partial pressure. Two sulphide layers grow on all of the steels investigated: These differ in the direction of growth as well as in their chemical and structural composition.

32158 (PNL-SA—9759) Flow and fracture in the fusion environment. Jones, R.H. (Pacific Northwest Lab., Richland, WA (USA)). 1981. Contract AC06-76RL01830. 13p. (CONF-810831—81). NTIS, PC A02/MF A01. Order Number DE82006882.

From Fusion reactor materials meeting; Seattle, WA, USA (9 Aug 1981).

Materials studies were performed for the following three areas: (1) austenitic stainless steels; (2) ferritic stainless steels; and (3) modelling for chemical environment effects on fracture. (MOW)

32159 (PUC-tn—07/80) Transfer matrix treatment of atomic chemisorption on transition metal surface. Mariz, A.M.; Koiller, B. (Pontificia Univ. Catolica do Rio de Janeiro (Brazil). Inst. de Fisica). May 1980. 17p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700101.

The atomic adsorption of hydrogen on paramagnetic nickel 100 surface is studied, using the Green's function formalism and the transfer matrix technique, which allows the treatment of the geometry of the system in a simple manner. Electronic correlation at the adatom orbital in a self consistent Hartree-Fock approach is incorporated. The adsorption energy, local density of states and charge transfer between the solid and the adatom are calculated for different crystal structures (sc and fcc) and adatom positions at the surface. The results are discussed in comparison with other theories and with available experimental data, with satisfactory agreement.

32160 (SAND—81-1952) Tearing during pinch-off of Rolamite fill tubes. Yost, F.G. (Sandia National Labs., Albuquerque, NM (USA)). Nov 1981. Contract AC04-76DP00789. 25p. NTIS, PC A02/MF A01. Order Number DE82006873.

A failure mechanism is proposed to explain the bubble streaming and trichloroethylene infiltration which has been observed in failed Rolamite devices. An intergranular oxide network forms in the Kovar fill tube as a result of the glass-to-metal seal processing; it is suggested that tearing occurs in this oxide network during a subsequent pinching-off operation. It is demonstratd that bending over a mandrel causes this intergranular network to widen and deepen in a tearing mode. A modified preoxidation heat treatment or partial oxidation procedure prevents this problem.

32161 (Y/DW—282) Potentiometric determination of percent porosity in nickel electroplates on uranium metal. Dietrich, W.C.; Johnson, E.E. (Oak Ridge Y-12 Plant, TN (USA)). 1982. Contract W-7405-ENG-26. 14p. (CONF-820301—2). NTIS, PC A02/MF A01. Order Number DE82007334.

From 2. American Electroplater's Society symposium on plating on difficult to plate metals; St Louis, MO, USA (Mar 1982).

A potentiometric procedure has been developed to determine the percent porosity of nickel electroplates on uranium metal. In this case, percent porosity is defined as the ratio of the exposed uranium surface to the nickel electroplate surface times 100. Basically, this procedure exploits the high chemical reactivity between uranium metal and chloride ions in aqueous solution. It involves the potentiometric measurement of the corrosion potentials of coupled uranium/nickel metal electrodes in 0.01 molar potassium chloride solution versus a double-junctioned calomel electrode. A mathematical treatment of observed potentiometric measurements from a two-point calibration technique permits a best-fit calibration for a particular porosity determination on the same nickel-plated sample.

32162 Method and apparatus for determining diameter and wall thickness of minute hollow spherical shells. Steinman, D.A. (to Department of Energy). US Patent 4,308,750. 5 Jan 1982. Filed date 30 May 1980. vp.

PAT-APPL-154638.

Method and apparatus for determining diameter and wall thickness of hollow microspheres or shells wherein terminal velocities of shells traveling in fluid-filled conduits of differing diameters are measured. A wall-effect factor is determined as a ratio of the terminal velocities, and shell outside diameter may then be ascertained as a predetermined empirical function of wall-effect factor.

For shells of known outside diameter, wall thickness may then be ascertained as a predetermined empirical function of terminal velocity in either conduit.

32163 **Rates of defect production by fission neutrons in metals at 4.7 K.** Coltman, R.R. Jr.; Klabunde, C.E.; Williams, J.M. (Oak Ridge National Lab., TN (USA). Solid State Div.). *Journal of Nuclear Materials;* **99**: No. 2/3, 284-293(Sep 1981).

As part of an interlaboratory program, we have measured the resistivity-damage rates at 4.7 K for the dilute alloys, V-300 ppm Zr, Nb-300 ppm Zr, and Mo-300 ppm Zr, irradiated by virtually unmoderated fission neutrons. In addition, Al, Ni, Cu, and stainless steel have also been measured to provide a broader data base for comparison with other experimental work using a variety of neutron spectra and with defect-production theory. A broad view of the results shows that the ratio of experimentally to theoretically determined production rates (damage efficiencies) for various fast-neutron spectra ranges from about 0.25 to 0.50. On the other hand, for a given element various neutron-energy spectra peaked from 1 to 15 MeV give variations in damage-efficiency values of only 7-30%.

32164 **α-γ transition of cerium metal.** Bringer, A. (Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.). Inst. fuer Festkoerperforschung). pp 397-400 of Valence fluctuations in solids. Proceedings of the Santa Barbara Institute of Theoretical Physics Conference, Santa Barbara, CA, USA, January 27-30, 1981. Falicov, L.M. (California Univ., Berkeley (USA)); Hanke, W. (Max-Planck-Institut fuer Festkoerperforschung, Stuttgart (Germany, F.R.)); Maple, M.B. (California Univ., San Diego, La Jolla (USA)) (eds.). Amsterdam, Netherlands; North-Holland (1981).

From Conference on valence fluctuations in solids; Santa Barbara, CA, USA (27 Jan 1981).

Two different explanations for the α-γ transition in cerium metal are currently under discussion. The promotional model assumes that at the phase transition the 4f electrons become unstable against transitions into 5d-band states and the α-phase is then treated as an intermediate valence system. Recent band structure calculations find a transition from a normal 4f-band metal to a metal with a spin polarized 4f band at approximately the atomic volume of the α-γ transition. No transfer of electrons takes place and the transition is interpreted as due to a Mott-localization within a singly occupied 4f band. In this paper, it is pointed out that the state used to describe the γ-phase does not correctly describe the atomic properties of localized 4f electrons. Such a state will be constructed and a method outlined to calculate its properties self consistently. Stability criteria of this state against band-formation and promotion of electrons between different bands are derived.

32165 **High-pressure neutron and X-ray diffraction study of TmSe.** Debray, D.; Kahn, R. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France)); Decker, D.L. (Brigham Young Univ., Provo, UT (USA)); Werner, A. (Max-Planck-Institut fuer Festkoerperforschung, Stuttgart (Germany, F.R.)); Loewenhaupt, M.; Holland-Moritz, E. (Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.). Inst. fuer Festkoerperforschung); Ray, D.K. (Paris-13 Univ., 93 - Villetaneuse (France)). pp 183-186 of Valence fluctuations in solids. Proceedings of the Santa Barbara Institute of Theoretical Physics Conference, Santa Barbara, CA, USA, January 27-30, 1981. Falicov, L.M. (California Univ., Berkeley (USA)); Hanke, W. (Max-Planck-Institut fuer Festkoerperforschung, Stuttgart (Germany, F.R.)); Maple, M.B. (California Univ., San Diego, La Jolla (USA)) (eds.). Amsterdam, Netherlands; North-Holland (1981).

From Conference on valence fluctuations in solids; Santa Barbara, CA, USA (27 Jan 1981).

Amongst all the known intermediate valence compounds the monochalcogenide TmSe is unique in the sense that it is the only such compound which shows i) a long-range magnetic order at low temperature, ii) a metal-insulator transition at Tsub(N), and iii) a temperature dependent spin fluctuation energy. To investigate the origin of its unusual physical properties, the authors have carried out high-pressure neutron elastic and inelastic as well as X-ray diffraction measurements on stoichiometric TmSe (a = 5.709A) at ambient and low temperatures. The basic aim of this work was to change, by the application of pressure, parameters which play an important role in the physics of the intermediate valence state and follow through by measuring physical quantities which are influenced by them.

32166 **Hydrogen ion impact desorption of sulfur from stainless steel.** Bastasz, R. (Sandia National Labs., Livermore, CA (USA)). *Journal of Nuclear Materials;* **93**: No. 94, 830-833(Oct 1980).

From 4. international conference on plasma surface interactions and controlled fusion devices; Garmisch-Partenkirchen, Germany, F.R. (21 - 25 Apr 1980).

Desorption cross-sections are reported for low-energy hydrogen ion impact on sulfur covered stainless steel surfaces. Using secondary ion mass spectrometry, the production rate of S^- was observed to decrease exponentially as a function of hydrogen ion fluence and provided a reliable means for determining desorption cross-sections in the absence of residual gas adsorption. The cross-section for sulfur desorption by hydrogen increased slightly as the incident ion energy decreased from 1.5 to 0.3 keV/atom. Similar results were obtained when H_2^+ or H_3^+ ion species were used in place of H^-. Impurity release in fusion devices from hydrogen ion impact is discussed briefly.

32167 **Combined depth profiling and thermal desorption of implanted deuterium in 304LN stainless steel.** Bohdansky, J. (Association Euratom-Max-Planck-Institut fuer Plasmaphysik, Garching (Germany, F.R.)); Wilson, K.L.; Pontau, A.E.; Haggmark, L.G.; Baskes, M.I. (Sandia National Labs., Livermore, CA (USA)). *Journal of Nuclear Materials;* **93**: No. 94, 594-600(Oct 1980).

From 4. international conference on plasma surface interactions and controlled fusion devices; Garmisch-Partenkirchen, Germany, F.R. (21 - 25 Apr 1980).

We have studied the trapping of 6 keV D^+_3 in 304LN stainless steel at temperatures from 295 to 375 K, with fluences up to 10^{19} atoms/cm^2. The retention in the first 0.5 μm depth was measurd by D(^{3}He,α)H nuclear reaction profiling, while the total retention in the sample was determined by thermal desorption. The concentration profiles and thermal desorption data are modelled with DIFFUSE, a numerical solution to diffusion in the presence of traps. The results confirm that while most deuterium is directly released during implantation, the retained deuterium is (a) trapped in radiation damage over the maximum ion range (approx. equal to 0.06 μm) with detrapping energies (sum of binding and migration energies) of 0.74 and 0.88 eV, and (b) migrating in the bulk at 0.6 eV. At elevated temperature (375 K) the amount of deuterium trapped in the near surface radiation damage becomes insignificant compared to the amount migrating in the bulk. These results are applied to fuel recycling in TFTR.

32168 **(NP—2901006) New stainless steel with a great future: 18Cr-2Mo.** (Climax Molybdenum G.m.b.H., Duesseldorf (Germany, F.R.)). [nd]. 24p. (In German). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82901006.

The new steel will be used in many fields of engineering, e.g. in the petrochemical industry.

3602 Ceramics, Cermets, And Refractories

REFER ALSO TO CITATION(S) 31939, 31996, 32068, 32068, 32069, 32069, 32235, 32700, 32880, 32880

32169 **(DFVLR-FB—79-32) Influence of processing conditions on the microstructure and the mechanical properties of reaction sintered silicon nitride.** Heinrich, J. (Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt e.V., Koeln (Germany, F.R.). Inst. fuer Werkstoff-Forschung; Technische Univ. Berlin (Germany, F.R.). Fachbereich Werkstoffwissenschaften). Sep 1979. 102p. (In German). NTIS (US Sales Only), PC A06/MF A01. Order Number DE82780277.

Thesis.

The microstructure of reaction sintered silicon nitride (RBSN) was changed in a wide range of varying green density, grain size of the silicon starting powder, nitriding conditions, and by introducing artificial pores. The influence of single microstructural parameters on mechanical properties like room temperature strength, creep behaviour, and resistance to thermal shock has been investigated. The essential factors influencing these properties were found to be total porosity, pore size distribution, and the fractions of α- and β-Si_3N_4. In view of high temperature engineering applications of RBSN possibilities to optimize the material's properties by controlled processing are discussed.

32170 **(DOE/ER/10856—1) Thermodynamics of phase-transformation toughening.** Burns, S.J.; Michener, J.R. (Rochester Univ., NY (USA). Dept. of Mechanical Engineering). 1981. Contract AC02-81ER10856. 13p. (CONF-810746—4). NTIS, PC A02/MF A01. Order Number DE82006247.

From International symposium on the fracture mechanics of ceramics; University Park, PA, USA (15 Jul 1981).

Phase transformation toughening is strongly related to the negative coefficient of thermal expansion and the volume contraction in the phase transformation in ZrO_2. The effect is the opposite of the embrittlement in ordinary phase transformations. Without a negative volume change upon heating or a positive volume change upon cooling the material would not be fracture toughened.

32171 **(FEI—1109) Inelastic neutron scattering study on crystal lattice dynamics of vanadium-oxygen interstitial solid solutions.** Danilkin, S.A.; Zakurkin, V.V.; Morozov, S.I.; Sumin, V.V. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Obninsk. Fiziko-Ehnergeticheskij Inst.). 1980. 15p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700090.

The paper deals with the investigation results of lattice dynamics of α, α', and β'-interstitial solid solutions of vanadium-oxygen system. Characteristics of bands of oxygen atom local oscillations are obtained. The constants of force interaction of oxygen atoms with the first and second vanadium neighbours are calculated in the approximation of an isolated impurity. Results of model calculations of the frequency spectrum of $V_{54}O_{11}$ disordered solid solution by concentration corresponding to β-phase, are presented.

32172 (IA—1364, pp 110-111) **Solid state formation of $Y_3Al_5O_{12}$.** Shimony, Y. Jul 1981. NTIS (US Sales Only), PC A13/MF A01.

In Research laboratories annual report 1980.

32173 **(KFK—3078) Investigations on swelling of U-PU mixed carbide.** Zimmermann, H. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Projekt Schneller Brueter; Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Inst. fuer Material- und Festkoerperforschung). Dec 1980. 23p. (In German). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82780279.

Mixed carbide fuel samples irradiated in various types of capsules were investigated with respect to fuel swelling and fission gas behaviour. The irradiations were carried out in the FR 2 reactor in Karlsruhe at temperatures between 300 and 1750°C up to 5.5% burnup. The swelling was evaluated by immersion density measurements in carbon tetrachloride. The fission gas determinations were carried out by measuring the released gas and by measuring the retained fission gas. The swelling rate of mixed carbide is a strong function of temperature. At temperatures below 1000°C it is between 1 and 1.5% per % burnup. At temperatures above 1000°C the swelling rate increases with temperature. It is about 3% per % burnup at 1300°C and about 12% per % burnup at 1750°C. The swelling rate at high temperatures decreases with increasing burnup due to a saturation of the fission gas bubble porosity. The fission gas release at high temperatures is comparable with that of oxide fuel at the same temperature.

32174 **(KFK—3088) Measurements of density and of thermal expansion coefficient of sodium tetraborate (borax)-UO_2 and of sodium metaborate-UO_2 solutions.** Dalle Donne, M.; Dorner, S. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Inst. fuer Neutronenphysik und Reaktortechnik; Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Projekt Schneller Brueter). Dec 1980. 26p. (EUR—7050e). NTIS (US Sales Only), PC A03/MF A01. Order Number DE82780278.

Measurements have been performed of the density and volumetric thermal expansion coefficient of liquid sodium tetraborate (borax) and of sodium metaborate both pure and with two different amounts of UO_2 dissolved in each. These data are required for the design of core-catchers based on sodium borates. The measurements have been performed with the buoyancy method in the temperature range from 850°C to 1325°C. The data for the pure borax and for the sodium metaborate agree reasonably well with the data from the literature, giving confidence that the measurements are correct and the new data for the salts with UO_2 are reliable.

32175 **Composition for use in high-temperature hydrogen-fluorine environments and method for making the composition.** Holcombe, C.E.; Kovach, L. (to Department of Energy). US Patent 4,309,467. 5 Jan 1982. Filed date 22 Aug 1980. vp.

PAT-APPL-180251.

The present invention relates to a composition particularly suitable for use as structural components subject to hightemperature environments containing gaseous hydrogen and fluorine. The composition of the present invention consists essentially of lanthanum hexaboride-molybdenum diboride with dispersed silicon. The composition is formed by hot pressing a powder mixture of lanthanum hexaboride as the major constituent and molybdenum disilicide. This composition exhibits substantial resistance to thermal shock and corrosion in environments containing hydrogen and fluorine gases at material surface temperatures up to about 1850° K. Upon exposure of the hot-pressed composition to high-temperature environments containing fluorine gases, a highly protective layer of lanthanum trifluoride containing dispersed molybdenum is formed on exposed surfaces of the composition.

32176 **Order-disorder transition in Sr_2IrD_5: evidence for square pyramidal IrD_5 units from powder neutron diffraction data.** Zhuang, J. (Brookhaven National Lab., Upton, NY); Hastings, J.M.; Corliss, L.M.; Bau, R.; Wei, C.Y.; Moyer, R.O. Jr. *Journal of Solid State Chemistry;* **40**: No. 3, 352-360(Dec 1981).

Neutron diffraction data have been collected on a powdered sample of Sr_2IrD_6 over a range of temperatures. The compound, which is cubic at room temperature, has been found to exhibit a gradual transformation to a tetragonal phase in the temperature range 200 to 140 K. As a result of the transition, deuterium atoms which randomly occupy sixfold positions in the cubic phase, become tetragonally ordered. A small fraction of the cubic phase remained untransformed at 4.2 K. Both the cubic and tetragonal structures are consistent with square pyramidal IrD_5 units with average Ir-D distances of 1.714 and 1.718 A, respectively. Agreement factors, R_1, for the two structural analyses are 3.44 and 4.94%.

3604 Polymers And Plastics

REFER ALSO TO CITATION(S) 32836

3606 Other Materials

REFER ALSO TO CITATION(S) 31800, 31809, 31983, 32108, 32108, 32426, 32718, 32809, 32827, 32840, 32841, 32842, 32843

32177 **(BNL—51390) Water-compatible polymer concrete materials for use in rapid repair systems for airport runways. Final report.** Sugama, T.; Kukacka, L.E.; Horn, W. (Brookhaven National Lab., Upton, NY (USA)). Mar 1981. Contract AC02-76CH00016. 128p. NTIS, PC A07/MF A01. Order Number DE82010994.

Water-compatible polymer concrete (PC) formulations have been developed which appear to have potential for use in all-weather rapid repair procedures for bomb-damaged runways. Formulations consisting of furfuryl alcohol, water-saturated aggregate, dry silica flour, promoters, and catalysts produced composites with properties suitable for repair purposes when mixed and polymerized at temperatures from -20° to 30°C. Calcium-unsaturated polyester complexed PC also produced excellent properties. However, the early strength criteria [2000 psi (13.78 MPa) at 1 h] and other requirements such as compatibility of the formulation with water and practical working times could be attained only at temperatures >20°C. This system can be polymerized under water. Studies of the polymerization reaction mechanisms, materials properties, costs, and potential placement methods were performed.

32178 **(CBPF-NF—023/80) Conjecture on the critical frontier of the fully anisotropic homogeneous quenched bond-mixed potts ferromagnet in square lattice.** Tsallis, C. (Centro Brasileiro de Pesquisas Fisicas, Rio de Janeiro). 1980. 18p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700088.

It is conjectured that a logarithmic provides a very accurate approximation of the yet unknown critical frontier of a fully anisotropic homogeneous quenched bond-mixed q-state Potts ferromagnet in square lattice, where the random coupling constant J is distributed according to the laws P(J) and P'(J) for 'horizontal' and 'vertical' bonds respectively. Such an equation contains as particular cases a great number of exact results as well as a few recent conjectures (which are definitively only approximate).

32179 **(CBPF-NF—029/80) Conjecture on the critical frontier of the ferromagnetic Potts model on planar lattices.** Tsallis, C.; de Magalhaes, A.C.N. (Centro Brasileiro de Pesquisas Fisicas, Rio de Janeiro). 1980. 18p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700089.

A conjecture is proposed for the approximate critical frontiers of the ferromagnetic q-state Potts model on planar lattices. This conjecture is verified, within a satisfactory degree of accuracy, for a variety of anisotropic and/or 'inhomogeneous' planar lattices (as well as for the first and second neighbour square one), and enables the prediction of a considerable number of new results (20 independent critical points and a few critical lines).

32180 (GSI—81-2, pp 185) **Equipment for producing, investigating and testing carbon foils with high hydrogen contents.** Baumann, H.; Bethge, K.; Reeh, W.; Stiehl, H.; Wirth, H.L. Mar 1981. NTIS (US Sales Only), PC A16/MF A01.
In Scientific report 1980.

32181 (GSI—81-2, pp 173) **TL-studies of ion-implanted CaF_2.** Thiel, K.; Bangert, U.; Herr, W. Mar 1981. NTIS (US Sales Only), PC A16/MF A01.
In Scientific report 1980.

32182 (GSI—81-2, pp 176) **Influence of nuclear tracks on ferromagnetic resonance linewidth of yttrium iron garnets.** Hansen, P.; Heitmann, H.; Spohr, R. Mar 1981. NTIS (US Sales Only), PC A16/MF A01.
In Scientific report 1980.

32183 **(INIS-mf—6726) Study of the maguemite-hematite transformation by magnetic resonance.** Portella, P.D. (Instituto Militar de Engenharia, Rio de Janeiro (Brazil)). Aug 1979. 87p. (In Portuguese). NTIS (US Sales Only), PC A05/MF A01. Order Number DE82780038.
Thesis.

The conversion of γ-Fe_2O_3 powders to α-Fe_2O_3 has been studied with the magnetic resonance technique. The residual fraction of γ-Fe_2O_3 was measured for several times and temperatures of isothermal treatments, in the range 450°C - 550°C. The transformation can be described by a first order Kinetic equation and the apparent activation energy is about 200 kJ/mol (48 kcal/mol). This value is independent of temperature and particle size. The experimental data suggest that the reaction is growth-controlled and nucleation occurs preferably at the particle surface.

32184 **(SAND—81-2567) Analysis of creep data for various natural rock salts.** Herrmann, W.; Lauson, H.S. (Sandia National Labs., Albuquerque, NM (USA)). Dec 1981. Contract AC04-76DP00789. 118p. NTIS, PC A06/MF A01. Order Number DE82007095.

Data from creep tests conducted on natural rock salt from Lyons, Kansas, Jefferson Island, Louisiana and Avery Island, Louisiana are analyzed using an exponential transient creep law. Steady-state creep rates are fitted to a thermally activated stress-power law, while transient creep parameters are fitted to a model which relates them to steady-state creep rates. The results are compared with previous results for salt from the Salado formation in the WIPP study area in Southeastern New Mexico.

32185 **(SAND—82-0025C) Liquid phase epitaxy techniques for compound semiconductor growth.** Dawson, L.R. (Sandia National Labs., Albuquerque, NM (USA)). 1982. Contract AC04-76DP00789. 16p. (CONF-820107—4). NTIS, PC A02/MF A01. Order Number DE82006299.

From SPIE optical coatings for energy efficiency and solar applications conference; Los Angeles, CA, USA (25 Jan 1982).

Liquid phase epitaxy (LPE) is method of crystal growth well suited to the preparation of a wide range of compound semiconductor materials, including GaAs, AlAs, GaP, InP, and GaSb, as well as their ternary and quaternary alloys. The advantages of LPE over other solution growth methods are substantial, primarily in material purity, doping flexibility, and dimensional control. It has particular advantages in achieving the complex multilayer structures required for many interesting optical devices, such as injection lasers, light emitting diodes, and photodetectors. LPE has appeared in many configurations in recent years, with the dominant variation at present being the sliding boat method. A good understanding of the capabilities of this method can be obtained by studying the growth of GaAs-Al/sub x/Ga/sub 1-x/As heterostructures.

32186 **Method and apparatus for drawing monocrystalline ribbon from a melt.** Ciszek, T.F.; Schwuttke, G.H. (to Department of Energy). US Patent 4,299,648. 10 Nov 1981. Filed date 20 Aug 1980. vp.
PAT-APPL-179919.

A method and apparatus are described for drawing a monocrystalline ribbon or web from a melt comprising utilizing a shaping die including at least two elements spaced one from the other each having a portion thereof located below the level of the melt and another portion located above the level of the melt a distance sufficient to form a raised meniscus of melt about the corresponding element.

32187 **Optical properties of Nd^{3+} in metaphosphate glasses.** Weber, M.J.; Saoyan, R.A. (California Univ., Livermore (USA). Lawrence Livermore National Lab.); Ropp, R.C. (Vitrex Corp., Warren, NJ (USA)). *Journal of Non-Crystalline Solids;* **44**: No. 1, 137-148(May 1981).

Absorption and fluorescence spectra and fluorescence lifetimes of Nd^{3+} ions were measured for the following polymeric metaphosphate glasses: [M(PO3)2]sub(n), where M = Mg, Ca, Sr, Ba, Zn, Cd, and Al(PO3)3. Judd-Ofelt intensity parameters for f-f transitions were derived from the integrated absorption spectra and used to calculate the spontaneous emission probabilities from the ^{4}Fsub(3/2) state. Metaphosphate glasses exhibit systematic variations of refractive indices, optical intensity parameters, fluorescence lifetimes and linewidths, and stimulated emission cross sections with alkaline earth. The origin of these variations and their implications for tailoring spectroscopic properties by compositional changes are discussed. Neodymium laser action in metaphosphate glasses is also considered.

40 CHEMISTRY

32188 (INIS-mf—6737) 1. Regional meeting on chemistry. Book of abstracts. (Sociedade Brasileira de Fisica, Sao Paulo; Sao Carlos Univ. (Brazil)). 1979. 119p. (In Portuguese). (CONF-7911167—(Absts.)). NTIS (US Sales Only), PC A06/MF A01. Order Number DE82780039.

From 1. Regional Meeting on Chemistry; Sao Carlos, SP, Brazil (22 Nov 1979).

Papers presented were entered in the data base separately. (WHK)

4001 Analytical And Separations Chemistry

REFER ALSO TO CITATION(S) 31780, 31817, 32217, 32218, 32242, 32487, 32530, 32578

32189 (GSI—81-2, pp 188) Separation of volatile superheavy elements from copper catchers. Wo Fan; Gaeggeler, H. Mar 1981. NTIS (US Sales Only), PC A16/MF A01.

In Scientific report 1980.

32190 (GSI—81-2, pp 189) Separation of reaction products by vacuum thermochromatography. Greulich, N.; Hickmann, U.; Trautmann, N. Mar 1981. NTIS (US Sales Only), PC A16/MF A01.

In Scientific report 1980.

32191 (IAE—3303/13) Possibility of chromatographic separation of curium and californium on phosphorus- and phosphorus-nitrogen-containing ionites. Dedov, V.B.; Kalinichenko, B.S.; Lejkin, Yu.A.; Polikarpova, A.P.; Tarasova, T.I.; Trukhlyaev, P.S.; Cherkasova, T.I.; Shvetsov, I.K. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Atomnoj Ehnergii). 1980. 37p. (In Russian). NTIS (US Sales Only), PC A03/MF A01. Order Number DE82700255.

Some phosphorus-and phosphorus-nitrogen-containing ionites for sorption and separation of curium and californium from nitric acid solutions (0.05-3N) are investigated. The greatest separation coefficients values are noted for SEhF, AF-2-1, AKBF ionites. The smallest specific heat values for lanthanides have the SF-B and AF-2-1 ionites. The Cm and Cf sorption mechanism is studied. It has been found that solvate numbers for Cm are nsub(3s)=0.73+-0.47 and for Cf-nsub(3S)=0.76+-0.31 which supposes as a basic sorbing form -$Me(NO_3)^{2+}$.

32192 (INIS-mf—6831) Multi trace element analysis of dry biological materials by neutron activation analysis including a chemical group separation. Weers, C.A. (Amsterdam Univ. (Netherlands)). 24 Sep 1980. 166p. NTIS (US Sales Only), PC A08/MF A01. Order Number DE82780194.

Thesis.

The principles of activation analysis and the practical aspects of neutron activation analysis are outlined. The limits which are set to accuracy and precision are defined. The description of the evaporation process is summarised in terms of the half-volume. This quantity is then used to define the resolving power. The formulation is checked by radiotracer experiments. Dried animal blood is used as the testing material. The pretreatment of the samples and (the development of) the destruction-evaporation apparatus is described. Four successive devices were built and tested. The development of the successive adsorption steps with active charcoal, Al_2O_3 and coprecipitation with $Fe(OH)_3$ is presented. Seven groups of about 25 elements in total can be determined this way. The results obtained for standard reference materials are summarized and compared with literature data.

32193 (IPEN-Pub—17) Comparative study of some methods for the determination of uranium used at the Instituto de Pesquisas Energeticas e Nucleares. Vasconcellos, M.B.A.; Armelin, M.J.A.; Fulfaro, R.; Lima, F.W. de. (Instituto de Pesquisas Energeticas e Nucleares, Sao Paulo (Brazil)). Aug 1980. 20p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700239.

A comparative study is made of some of the methods employed at the IPEN for the analysis of uranium. The methods chosen are: epithermal neutron activation analysis, delayed neutron counting activation analysis and spectrophotometric analysis with dibenzoylmethane. For the study of the three methods cited, six reference ores of the International Atomic Energy Agency are analyzed. The results obtained for the analysis of the standard ores agreed well between themselves in most cases. The method which presents best precision and accuracy, in the case of the samples analyzed, is the delayed neutron counting method, with an average precision and accuracy of the order of 2%. In the spectrophotometric analysis, and average precision and accuracy of about 3% is obtained and 5% for epithermal neutron activation analysis. The total errors, which include the precision and the accuracy, are inferior to 25% in practically all cases, which allows the inclusion of the methods in the 'Excellent' category, according to McFarren's statistical criterion.

32194 (JAERI-M—9159) Chemistry of nitro complexes of nitrosylruthenium. Akatsu, E. (Japan Atomic Energy Research Inst., Tokyo). Nov 1980. 23p. (In Japanese). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700249.

The chemical behavior of ruthenium is known to be especially complex because of its chemical property. This caused some problems of ruthenium in the treatment of highly radioactive fission products encountered in the reprocessing of the spent fuel. Nitrous acid and nitrogen oxides, formed on the dissolution of the spent fuel in nitric acid, changed ruthenium of fission products into nitrosylruthenium. Thus, the nitrosylruthenium has been studied by many investigators. In this report, data reported on nitro complexes of nitrosylruthenium was reviewed together with author's experiences obtained through the study of tetranitro complex of nitrosylruthenium.

32195 (JINR—6-81-75) Concentration of trace elements from Cheleken peninsula thermal brines by means of foam flotation. Chosnovska, V.; Langrok, Eh.; Maslov, O.D. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Reactions). 1981. 7p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700250.

The application of foam flotation process to the separation and concentration of a number of trace elements in the Cheleken Peninsula geothermal waters is investigated. The elements were separated with iron-hydroxide, gelatin and air. In this study as radioactive tracers ^{200}Tl, ^{203}Pb, ^{204}Bi, sup(188, 189)Pt, sup(186, 188)Ir, ^{185}Os, ^{99}Mo were used. The influence of the gelatin concentration, time of air flow passing-through, and pH value on the efficiency of investigated element separation was studied. The results of the experiments show that the elements which exist in geothermal waters as cations, anions, complexes or colloids can be collected by coprecipitation or by sorption on floated metal hydroxides with the 70 to 100 percent efficiency. It could be possible to achieve selective foam separation of some elements by control of the pH value of geothermal waters.

32196 (JINR—18-80-841) Methods of gold content determination in geological samples with the use of microtron resonance neutrons. Belov, A.G.; Borcea, E.; Zhuchko, V.E.; Zamyatnin, Yu.S.; Kul'kina, L.P.; Teterev, Yu.G.; Kho Den Gi; Hernandez, A.T. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Reactions). 1980. 9p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700240.

The methods for determination of gold content in geological samples are developed. The methods are based on the $^{197}Au(n, \gamma)$ sup(198)Au(Tsub(1/2)=2.7 day, Esub(γ)=411.9 keV using for the activation analysis resonance neutrons from the compound of uranium-beryllium neutron converter on the electron accelerator-microtron. Several thousand samples were analysed, the results were compared with chemical analysis data. The sensitivity is not worse than 10^{-5} % and the reproducibility of results is on the level of 10 %.

32197 **(KAERI/RR—210/80) Development of chemical analysis techniques.** (Korea Advanced Energy Research Inst., Seoul (Republic of Korea)). 1981. vp. NTIS (US Sales Only), PC A08/MF A01. Order Number DE82700241.

Selected papers are indexed separately.

32198 **(KAERI/RR—244/80) Study on the radioisotope-identification.** Kim, S.K.; Huh, Y.H. (Korea Advanced Energy Research Inst., Seoul (Republic of Korea)). 1980. 62p. (In Korean). NTIS (US Sales Only), PC A04/MF A01. Order Number DE82700243.

The subroutine IDENT developed by Carder et al was modified to suit our own purpose. The subroutine compares peaks found by an archetypal line fitting program with library peaks to make possible isotope identifications. To maximize the degree of confidence in the isotope identification, the subroutine carries out a half-life check and also confirms that the most prominent gamma-ray of the isotope concerned is present. Using the library data, together with information on the neutron flux, duration of the irradiation, subsequent decay time, and gamma-detection efficiency, the subroutine calculates the masses of elements identified in the sample, and can handle spectra acquired during either simple or cyclic irradiation.

32199 **(KAERI/RR—272/80) Study on the neutron activation analysis.** Yang, K.R.; Kim, N.B.; Lee, K.Y. (Korea Advanced Energy Research Inst., Seoul (Republic of Korea)). 1981. 34p. (In Korean). NTIS (US Sales Only), PC A03/MF A01. Order Number DE82700244.

A preconcentration of trace impurities and radiochemical separation scheme for neutron activation analysis is developed for the determination of 23 elements in nuclear fuel uranium. PH 3 solution of sulfuric acid contained uranium ions(VI) is loaded on anion-exchange resin column (Dowex 1 x 8, 100 - 200Mesh) for separation of impurities from uranium. All of uranium ions are absorped on the anion exchange resin but 23 elements of impurities are eluated over 98%. After irradiation of the eluate. The radiochemical separation scheme is applied. The scheme is based on a group separation using ion-exchange resin and mineral exchanger. Present work has employed mineral acids and their partly organic mixture excluding HF as the media as well as common glass wares. For the determination, gamma-ray spectroscopy using 3" x 3" NaI (TI) detector and a single comparator method are used.

32200 **(PNL-SA—8945) Design and environmental applications of an ultra-low-background, high-efficiency intrinsic Ge gamma-ray spectrometer.** Wogman, N.A. (Pacific Northwest Lab., Richland, WA (USA)). Apr 1981. Contract AC06-76RL01830. 18p. (CONF-810409—5; IAEA-SM—252/25). NTIS, PC A02/MF A01. Order Number DE82005902.

From IAEA international symposium on methods of low-level counting and spectrometry; Berlin, F.R. Germany (6 Apr 1981).

A coincidence shielded intrinsic Ge gamma-ray spectrometer incorporating a 25% efficient, high resolution coaxial diode inside a 30 cm diameter NaI(Tl) shield is described. System design eliminates the major cause of background and minimizes cosmic-ray created background events through the use of electronic means. The system provides a peak-to-Compton ratio of greater than 1000 to 1 for ^{137}Cs and high sensitivity for both low and high level radionuclide measurements. At 3 MeV the background is 0.000058 counts per minute per keV. At 1 MeV it is 0.00048 counts per minute per keV, and at 0.5 MeV it is 0.0045 counts per minute per keV. Traces of primordial radionuclides create background events such as at 2.614 MeV (0.016 counts per minute total peak area), at 2.448 MeV (0.0058 counts per minute per total peak area), and at 2.204 MeV (0.023 counts per minute per total peak area). The system is discussed with respect to its background design, methods to improve its design, and its application to measurements of neutron activated and environmental materials problems.

32201 **(PUC-tn—14/79) Correction factor for hair analysis by PIXE.** Montenegro, E.C.; Baptista, G.B.; de Castro Faria, L.V.; Paschoa, A.S. (Pontificia Univ. Catolica do Rio de Janeiro (Brazil). Inst. de Fisica). Jun 1979. 19p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE81700955.

From 4. international conference on ion beam analysis; Denmark (25 - 29 Jun 1979).

The application of the Particle Induced X-ray Emission (PIXE) technique to analyse quantitatively the elemental composition of hair specimens brings about some difficulties in the interpretation of the data. The present paper proposes a correction factor to account for the effects of energy loss of the incident particle with penetration depth, and x-ray self-absorption when a particular geometrical distribution of elements in hair is assumed for calculational purposes. The correction factor has been applied to the analysis of hair contents Zn, Cu and Ca as a function of the energy of the incident particle.

32202 **(PUC-tn—22/80) Effects of X-ray absorption in the analysis of thick target samples by XRF.** Baptista, G.B.; Montenegro, E.C.; de Barros Leite, C.V.; Paschoa, A.S. (Pontificia Univ. Catolica do Rio de Janeiro (Brazil). Inst. de Fisica). Sep 1980. 14p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700245.

The accuracy of the quantitative analysis of thick targets by XRF is impaired by effects due to the absorption of x-rays in the matrix associated with the non-uniformity of the x-ray beam and the lack of knowledge of the actual distribution of trace elements in the target. The uncertainty in the elemental mass associated to a definite number x-rays detected is discussed in the paper. A correction factor is derived to account specifically for the effect of the absorption of x-rays and the non-uniformity of the x-ray beam.

32203 **(PUC-tn—24/80) Analysis of trace elements in human hair by PIXE.** Baptista, G.B.; Montenegro, E.C.; Paschoa, A.S.; Barros Leite, C.V. de. (Pontificia Univ. Catolica do Rio de Janeiro (Brazil). Inst. de Fisica). Oct 1980. 15p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700246.

The PIXE method was applied to the analysis of trace elements in scalp hair using two methods for target preparation. In the first method eight hair strands each with nearly cylindrical geometry and approximately the same diameter were selected and placed on an aluminum frame. In the second method a given mass of hair was dissolved with nitric acid and a known amount of strontium was added to the solution and dripped on a membrane filter using a micropipet. The results for the concentrations of trace elements in hair obtained by the two methods are compared and several aspects of the analysis is discussed.

32204 **(Y/DK—285) Vaporization of sediments with a pulsed transverse excitation at atmospheric pressure (TEA) CO_2 laser system.** Smyrl, N.R.; King, H.G. Jr. (Oak Ridge Y-12 Plant, TN (USA)). 31 Dec 1981. Contract W-7405-ENG-26. 21p. NTIS, PC A02/MF A01. Order Number DE82005669.

A transverse excitation at atmospheric pressure (TEA) pulsed CO_2 laser equipped with an adjunct called a Lasertrace has been used to generate vapor and/or particulates from sediment samples. The material thus obtained can be transferred to analytical systems for analysis making possible the analysis of solids by techniques previously suitable only for liquids or gases. Approximately one milligram of vapor and/or particulates was obtained in a short period of time by this method, suitable for transport to other systems.

32205 **Clustering of metal atoms in organic media. 9. High-activity Ni/MgO catalysts prepared by metal vapor methods. Surface area and particle size effects.** Matsuo, K.; Klabunde, K.J. (Kansas State Univ., Manhattan). *Journal of Catalysis;* **73**: No. 2, 216-227(Feb 1982). Contract EX-76-C-01-2211.

A metal vapor method was employed to prepare highly dispersed Ni metal catalysts (solvated metal atom dispersed = SMAD

catalyst) supported on MgO. Compared with conventional Ni/MgO compositions, the SMAD catalysts showed much greater activities for all reactions studied (hydrogenolysis of methylcyclopentane, MCP; hydrogenation/hydrogenolysis of toluene, TOL; methanation of carbon monoxide, CO; dehydration of isopropyl alcohol, IPA). These high activities for the SMAD catalysts are attributed to the high surface area of Ni on MgO and the high percentage of this Ni in a zero-valent state (reduction degree). Conventional methods for preparing Ni/MgO catalysts did not yield nearly such favorable surface areas or reduction degrees. Nickel particle size effects were observed during hydrogenolysis studies of MCP and hydrogenation studies of TOL. These phenomena are explained by assuming the size of an active Ni particle to be largest for hydrogenolysis of MCP > hydrogenation of TOL > methanation of CO ≃ dehydrogenation of IPA. 8 figures, 2 tables.

4002 Inorganic And Physical Chemistry

REFER ALSO TO CITATION(S) 31826, 32176, 32215, 32218, 32232, 32280

32206 **(DOE/ER/10381—3) Integrated approach to the systematic synthesis, characterization, and catalytic activity of novel heterogeneous catalysts. Final progress report.** Brenner, A. (Wayne State Univ., Detroit, MI (USA)). 13 Nov 1981. Contract AS02-79ER10381. 23p. NTIS, PC A02/MF A01. Order Number DE82004898.

The surface chemistry and catalytic activity of a new class of heterogeneous catalysts, carbonyl complexes directly deposited on high surface area inorganic supports was investigated. A new and highly efficient characterization technique, temperature programmed decomposition (TPDE) was employed coupled with automated activity measurements. TPDE spectra of all elements which have carbonyl complexes have been obtained, including a variety of cluster and mixed-metal complexes. These spectra contain quantitative information on the stoichiometry and oxidation state of the catalysts at each stage of activation. Extensive chemisorption data have also been obtained. Each of the catalysts has been tested for several model reactions: ethylene hydrogenation, ethane hydrogenolysis, and methanation. The combination of TPDE and activity data has led to a structure-activity relationship which in > 90% of the cases allows the a priori prediction of the preferred temperature regime for catalyst activation, if the use of a special dehydroxylated alumina will enhance activity, the effect of high temperature reduction and redox treatments on activity, and for all treatments if the resulting catalyst is likely to be lower, similar, or higher in activity than a conventional catalyst. There is a dichotomy in both surface chemistry and activity between catalysts derived from base and noble metals, with the most dramatic improvements being with the base metal catalysts. Specifically, catalysts of twelve different metals have been prepared with dispersions much higher than their conventional analogues, six catalysts are at least 10-fold higher in activity for ethylene hydrogenation, seven catalysts are at least 10-fold more active for ethane hydrogenolysis, and ten catalysts are at least two-fold more active for methanation. Neither cluster nor mixed-metal complexes showed activity significantly different from their individual components.

32207 (IA—1364, pp 101) **Polytypism in $RbMnCl_3$. Neutron diffraction study of the cubic perovskite structure compound.** Gurewitz, E.; Melamud, M.; Horowitz, A.; Shaked, H. Jul 1981. NTIS (US Sales Only), PC A13/MF A01.

In Research laboratories annual report 1980.

32208 (IA—1364, pp 101-103) **Polytypism in $KMnCl_3$. Neutron diffraction study of the distorted perovskite structure compound.** Gurewitz, E.; Melamud, M.; Horowitz, A.; Shaked, H. Jul 1981. NTIS (US Sales Only), PC A13/MF A01.

In Research laboratories annual report 1980.

32209 (IA—1364, pp 103) **Cobalt distribution in $LaNi_4Co$. A neutron diffraction study.** Gurewitz, E.; Pinto, H.; Dariel, M.P.; Shaked, H. Jul 1981. NTIS (US Sales Only), PC A13/MF A01.

In Research laboratories annual report 1980.

32210 (IA—1364, pp 103-104) **Crystallographic structure of LaNisub(4)CoDsub(y). A neutron diffraction study.** Gurewitz, E.; Pinto, H.; Dariel, M.P.; Shaked, H. Jul 1981. NTIS (US Sales Only), PC A13/MF A01.

In Research laboratories annual report 1980.

32211 (IA—1364, pp 110) **Cd diffusion into PbTe.** Silberg, E.; Sternberg, Y.; Yellin, N. Jul 1981. NTIS (US Sales Only), PC A13/MF A01.

In Research laboratories annual report 1980.

32212 **(Juel—1669) Experimental investigation about the kinetics of sulfur trioxide-splitting.** Savvidis, E. (Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.). Inst. fuer Reaktorbauelemente). Aug 1980. 100p. (In German). NTIS (US Sales Only), PC A05/MF A01. Order Number DE82902153.

Thesis.

The splitting of the SO_3 (SO_3 reversible $SO_2 + 1/2\ O_2$) is the key reaction of the thermochemical cycle process of the sulfuric acid group. In this work the experimental investigation about the kinetics of this reaction is presented. The experiments were carried out in a streaming tube which was used as a differential reactor. There were also investigated the homogeneous and the heterogenous catalytic reaction in the temperature range between 750 to 950°C and the pressure range between 1 to 37 bars. The evaluation of the results were made using the exponential, Hinshelwood and porous model. In the appendix of this work are also presented the basic calculations for the lay-out of the SO_3-splitting reactors.

32213 **Conversion of alkali metal sulfate to the carbonate.** Sheth, A.C. (to Department of Energy). US Patent 4,309,398. 5 Jan 1982. Filed date 1 Oct 1979. vp.

PAT-APPL-080726.

A process for converting potassium sulfate to potassium carbonate in which a mixture of potassium sulfate and calcium oxide are reacted at a temperature in the range of between about 700° C and about 800° C. With a gaseous mixture having a mi amount of hydrogen and/or carbon monoxide in a diluent with the calcium oxide being present in an amount not greater than about 20 percent by weight of the potassium sulfate to produce aqueous mixture of potassium sulfide, potassium bisulfide, potassium hydroxide and calcium sulfide and a gaseous mixture of steam and hydrogen sulfide. The potassium and calcium salts are quenched to produce an aqueous slurry of soluble potassium salts and insoluble calcium salts and a gaseous mixture of steam and hydrogen sulfide. The insoluble calcium salts are then separated from the aqueous solution of soluble potassium salts. The calcium salts are dried to produce calcium sulfide, calcium bisulfide and steam, and then, the calcium sulfide and calcium bisulfide are converted to the oxide and recycled. The soluble potassium salts are carbonated to produce potassium carbonate which is concentrated and the precipitated crystals separated. The sulfurcontaining compounds are further treated.

32214 **^2D and ^{133}Cs NMR study of the hydrogen bond network and antiferroelectric phase transition of cesium trihydrogen selenite.** Vinogradova, I.S. (L.V. Kirensky Inst. of Physics Academy of Sciences, USSR). *Journal of Solid State Chemistry;* 40: No. 3, 361-368(Dec 1981).

The ^2D and ^{133}Cs NMR spectra of deuterated and protiated single crystals of antiferroelectric cesium trihydrogen selenite have been studied in the high- and low-temperature phases. The number of chemically nonequivalent hydrogen bonds, their lengths, and directions in the unit cell were determined from deuteron electric field gradient tensors. The deuterons of centered hydrogen bonds have been found disordered in the paraelectric phase over two equivalent sites on either side of a center of symmetry. The antiferroelectric phase transition is accompanied by order-disorder phenomena of the H system and displacive behavior of the heavy-ion system.

4003 Organic Chemistry

REFER ALSO TO CITATION(S) 31722, 31826, 32206, 32239, 32280, 32701

32215 **(DOE/ER/04949—1) Reduction of carbon monoxide. Past research summary.** Schrock, R.R. (Massachusetts Inst. of Tech., Cambridge (USA)). 1982. Contract AS02-78ER04949. 90p. NTIS, PC A05/MF A01. Order Number DE82007524.

Research programs for the year on the preparation, characterization, and reactions of binuclear tantalum complexes are described. All evidence to date suggest the following of these dimeric molecules: (1) the dimer does not break into monomers under mild conditions; (2) intermolecular hydride exchange is not negligible, but it is slow; (3) intermolecular non-ionic halide exchange is fast; (4) the ends of the dimers can rotate partially with respect to one another. The binuclear tantalum hydride complexes were found to react with carbon monoxide to give a molecule which is the only example of reduction of CO by a transition metal hydride to give a complex containing a CHO ligand. Isonitrides also reacted in a similar manner with dimeric tantalum hydride. (ATT)

32216 **(JAERI-M—9336) Thermal ion-molecule reactions in oxygen-containing molecules.** Kumakura, M. (Japan Atomic Energy Research Inst., Tokyo). Feb 1981. 411p. NTIS (US Sales Only), PC A18/MF A01. Order Number DE82700259.

The energetics of ions and the thermal ion-molecule reactions in oxygen-containing molecules have been studied with a modified time-of-flight mass spectrometer. It was found that the translational energy of ion can be easily obtained from analysis of the decay curve using the time-of-flight mass spectrometer. The condensation-elimination reactions proceeded via cross- and homo-elimination mechanism in which the nature of intermediate-complex could be correlated with the nature of reactant ion. It was elucidated that behavior of poly-atomic oxygen-containing ions on the condensation-elimination reactions is considerably influenced by their oxonium ion structures having functional groups. In addition, the rate constants of the condensation-elimination reactions have affected with the energy state of reactant ion and the dipole moment and/or the polarizability of neutral molecule. It was clarified that the rate constants of the ion-molecule clustering reactions in poly-atomic oxygen-containing molecules such as cyclic ether of six member rings are very large and the cluster ions are stable owing to the large number of vibrational degree of freedom in the cluster ions.

32217 **Studies of carbon monoxide hydrogenation over ruthenium using transient response techniques.** Cant, N.W.; Bell, A.T. (Univ. of California, Berkeley). *Journal of Catalysis;* **73**: No. 2, 257-271(Feb 1982). Contract W-7405-ENG-48.

Transient response isotopic tracing was used together with in situ infrared spectroscopy to elucidate the dynamics of several elementary processes believed to occur during CO hydrogenation over ruthenium catalysts. Chemisorbed CO was observed to exchange very rapidly with gas phase CO and under reaction conditions the two species are in equilibrium. A similar conclusion was reached regarding the relationship between gas phase H_2 and adsorbed H atoms. The dissociation of molecularly adsorbed CO to form atomic carbon and oxygen was found to require vacant surface sites and to be reversible. It was shown that while CO is the principal adsorbed species present on the catalyst surface under reaction conditions, the catalyst also maintains a significant inventory of nonoxygenated carbon but no chemisorbed oxygen. It was also found that the rate at which nonoxygenated carbon undergoes hydrogenation is faster than the rate at which adsorbed CO is hydrogenated. This observation supports the hypothesis that the nonoxygenated carbon is an intermediate in CO hydrogenation. 9 figures, 3 tables.

32218 **Crown ethers as size-selective synergists in solvent extraction systems: a new selectivity parameter.** Kinard, W.F.; McDowell, W.J. (Oak Ridge National Lab., TN (USA)). *Journal of Inorganic and Nuclear Chemistry;* **43**: No. 11, 2947-2953(1981).

Mixtures of macrocyclic polyethers (crown ethers) and organic-phase-soluble liquid cation exchangers have been found to produce a synergistic effect in the extraction of metal ions. The synergistic effect is size selective; that is, it tends to be greatest for those ions that best fit the crown ether cavity. The mixtures of a liquid cation exchanger and a crown ether also allow metal ion extraction from common mineral-acid anion systems (NO_3^-, Cl^-, SO_4^{2-}) that would be impossible with the crown ether alone, because of the difficulty of solubilizing those anions in nonpolar solvents. This cooperation makes the use of crown ethers as size-selective coordinators available for process applications. Size selectivity of compounds such as crown ethers may thus become a useful new parameter in designing selective solvent extraction systems. Results are reported for alkali (including Cs) and alkaline earth (including Sr) extraction by HDEHP mixed with various crown ethers.

4004 Electrochemistry

REFER ALSO TO CITATION(S) 32242, 32243

32219 (GSI—81-2, pp 233) **Electroplating workshop.** Wilhelm, K.; Gaiser, H.; Eckhardt, H.; Blasche, K. Mar 1981. NTIS (US Sales Only), PC A16/MF A01.

In Scientific report 1980.

32220 **Catalytic behavior of a cation in a solid solution: an electrostatic potential approach.** Kung, H.H. (Northwestern Univ., Evanston, IL). *Journal of Catalysis;* **73**: No. 2, 387-395(Feb 1982).

A method to calculate the electrostatic potential at a surface cation site and at an adsorbate site is described. The method is applied to evaluate the difference in the electrostatic potential at the two sites when the cation is placed in different oxide solid solutions of the same crystal structure. It is concluded that the ability of the cation to accept an electron from the adsorbate increases if the cation is in a more ionic oxide matrix, and vice versa. This conclusion appears to be consistent with published experimental data involving adsorption and catalysis on a number of solid solutions. 2 figures, 1 table.

4005 Photochemistry

32221 **(DOE/ER/00913—2) Contribution of electronically excited states to the radiation chemistry of organic systems. Progress report, September 1, 1980-November 30, 1981.** Lipsky, S. (Minnesota Univ., Minneapolis (USA)). 1981. Contract AS02-78ER00913. 12p. NTIS, PC A02/MF A01. Order Number DE82004906.

The effect of a perfluorocarbon to quench the photoionization current of N,N,N',N'-tetramethyl-p-phenylenediamine (TMPD) in a non-polar liquid has been studied as a function of temperature, excitation energy and the nature and composition of the solution. A model is developed to explain the results on the basis of an interaction of the quencher with an epithermal electron. Contact charge-transfer bands involving saturated hydrocarbons and perfluorocycloalkanes have been discovered. Similar bands are not observed for hydrocarbon contact with perfluoro-n-alkanes. Also, perfluorocycloalkanes are found to have very strong quenching effect on saturated hydrocarbon fluorescence. Analysis of the quenching behavior indicates unusually large ($\simeq$ 14 A) encounter radii for this quenching interaction. A long-range charge transfer appears to be implicated. The fluorescence quantum yield of liquid cyclohexane has been determined for excitation wavelengths from 165 nm to 178 nm. This data together with new measurements on the intensity of fluorescence of cyclohexane liquid excited by ^{85}Kr beta particles confirms that $G(S_1) = 1.45$. The ratio of excimer to monomer fluorescence of dilute solutions of polystyrene in various solvents has been observed to increase with increasing polymer molecular weight and decreasing thermodynamic quality of the solvent. The effects are demonstrated to be not attributable to excimer formation via non-adjacent sites.

32222 (DOE/ER/02026—41) Studies in chemical reactivity. Progress report, November 30, 1980-1 December 1981. Carr, R.W. Jr. (Minnesota Univ., Minneapolis (USA). Dept. of Chemical Engineering and Materials Science). 1981. Contract AS02-76ER02026. 34p. NTIS, PC A03/MF A01. Order Number DE82006891.

An investigation of the photooxidation of 1,3-dichlorotetralfuoroacetone has been completed, and a manuscript describing the results has been submitted for publication. In this work, measurements of product quantum yields have led to a mechanism for the reaction of CF_2Cl radicals with O_2, and have given evidence for the reaction of CF_2ClO radicals with CO to produce CO_2. Work has continued on the flash photolysis of 1,3-dichlorotetrafluoroacetone, with emphasis placed on spectroscopic observations of the rate of formation of ClO. An investigation of the flash photolysis of ketene, with detection of products and transient species by time resolved mass spectrometry, is continuing. This investigation seeks information on the kinetics and mechansims $CH_2(^3B_1)$ reactions. An experiment to detect luminescence from $CH_2(^1B_1)$, where $CH_2(^1B_1)$ is produced by pulsed laser photolysis of diazomethane, has been set up. An analysis of a photochemical smog mechanism by variational sensitivity analysis is being done. A preprint on photolysis of 1-iodopropane is included.

4006 Radiation Chemistry

REFER ALSO TO CITATION(S) 32221

32223 (INR—1746/17/C/A) Gas phase negative ion reactions on electron irradiation of NO_2. Wlodek, S.; Luczynski, Z.; Wincel, H. (Institute of Nuclear Research, Warsaw (Poland)). 1978. 13p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE81700959.

The negative ion clustering reactions were investigated in pure NO_2 and in the mixtures with H_2, N_2, Ar and C_2H_6 at pressures from 0.1 to 2.5 torr, at temperatures between 230-370 K, and in tha range of ionizing electron energies from 100 to 1000 eV. The primary nitrite ions undergo conversion to nitrate ions and the latter are very effectively clustered with HNO_3 molecules present in small quantities in the studied systems. The clusters $NO_2^-.(HNO_3)n$ up to n=4 were observed. The significant effect of electron ionizing energy on the clustering efficiency of NO_3^- was observed. This observation was discussed in terms of different structures and different vibrational excitation of NO_3^- ions produced under conditions of our experiments.

32224 (ZfI-Mitt—35, pp 5-59) Primary processes of the radiation-induced cationic polymerization of aromatic olefins studied by pulse radiolysis. Brede, O.; Boes, J.; Helmstreit, W.; Mehnert, R. Mar 1981. NTIS (US Sales Only), PC A05/MF A01.

In Reports of the Zentralinstitut fuer Isotopen und Strahlenforschung.

By pulse radiolysis of solutions of aromatic olefins (styrene, 1-methylstyrene, 1,1-diphenylethylene) in nonpolar solvents (cyclohexane, carbon tetrachloride, n-butyl chloride) the mechanism and kinetics of primary processes of radiation-induced cationic polymerization were investigated. In cyclohexane, radical cations of the olefins are generated by charge transfer from solvent cations (k about 10^{11} l $mol^{-1}s^{-1}$). These cations dimerize in a diffusion-controlled reaction (k approximately 10^{10} l $mol^{-1}s^{-1}$). The next step of chain-growth is slower by 3 to 4 orders of magnitude. Furthermore, in carbon tetrachloride and in n-butyl chloride growing olefin cations are produced by a reaction of the radical cations with the solvent as well as by addition of solvent carbonium ions to the monomer. In strongly acidic aqueous solution of olefins radical cations produced indirectly from hydroxycyclohexadienyl radicals dimerize and react in a subsequent step by deprotonation forming non-saturated dimer radicals. The established reaction mechanism shows that in the case of radiation-induced cationic polymerization it is not possible to define a uniform first step of the chain reaction.

32225 (ZfI-Mitt—35, pp 61-71) Reaction kinetics of cationic primary products in nonpolar solutions. Naumann, W.; Boes, J.; Mehnert, R.; Brede, O. Mar 1981. (In German). NTIS (US Sales Only), PC A05/MF A01.

In Reports of the Zentralinstitut fuer Isotopen und Strahlenforschung.

A theoretical model for describing reactions of scavengers with primary cations in irradiated nonpolar solvents is presented. Rate constant expressions given are derived by assuming the transport of the cationic state in the solvent and the true reaction with a scavenger molecule as electron transfer processes. In systems CCl_4/scavenger the radiation-induced ionic primary processes were studied by pulse radiolysis. The rate constants obtained for alkyl chlorides, alkanes, olefines and aromatics as scavengers show a characteristic dependence on the difference between solute and scavenger ionisation potentials. The theoretical model allows the interpretation of the experimental results.

32226 Dependence of conduction band energy and electron mobility on fluid density. Holroyd, R.A.; Cipollini, N.E. (Brookhaven National Lab., Upton, NY (USA)). pp 228-235 of Proceedings of the 6th International Congress of Radiation Research. Okada, S.; Imamura, M.; Terashima, T.; Yamaguchi, H. (eds.). Tokyo, Japan; Japanese Association for Radiation Research (1979).

From 6. international congress symposium on radiation research and stem cells; Tokyo, Japan (13 May 1979).

Measurements of electron mobility and conduction band energy are reported as a function of density for neopentane and tetramethylsilane. Electron mobilities are for the gas phase at a temperature just above the critical temperature and for densities between 0.1 and 3.0 x 10^{21} molecules/cc. The band energies (V_0) are for the gas phase over the same density range and temperature as well as for the liquid from 25° to the critical temperature. These data permit a comparison between V_0 and electron mobility over the entire density range. At low densities V_0 from work function shifts is given by $(h^2/2\pi m)N\alpha$, where the parameter α can be evaluated from mobility data. At an intermediate density there is a transition and V_0 changes abruptly to more negative values; in this transition region the mobility is minimum. Throughout the intermediate and high density range V_0 remains negative and changes only very slowly. The electron mobility is a maximum at a density of 3.5 x 10^{21} molecules/cc where V_0 is a minimum. In this density range the electron is scattered by density fluctuations which perturb the potential.

32227 Rates, distances, and energy control of electron tunneling reactions in rigid media. Miller, J.R.; Beitz, J.V. (Argonne National Lab., IL (USA)). pp 301-308 of Proceedings of the 6th International Congress of Radiation Research. Okada, S.; Imamura, M.; Terashima, T.; Yamaguchi, H. (eds.). Tokyo, Japan; Japanese Association for Radiation Research (1979).

From 6. international congress symposium on radiation research and stem cells; Tokyo, Japan (13 May 1979).

Electron tunneling leads to the transfer of trapped positive or negative charges by tens of angstrom in rigid matrices. Electron tunneling reactions occur after the radiolysis of a rigid inert matrix containing two added solutes. The initial species, the matrix, trapped electrons and trapped positive charges of holes, can each react with either solute, and both negative and positive charges can be transferred from one solute to another. These reactions occur by long range tunneling. Trapped electrons can react with radiation-produced free radicals, and ion recombination can occur between all possible pairs of + and - species. Franck-Condon effects give energy specificity to charge transfer and ion recombination, and add sensitivity to molecular structure, solvation and H/D isotope effects. The specificity is important in photosynthesis and solar energy storage as well as radiation chemistry. Hopping versus tunneling seemed to be settled in favor of tunneling for intermolecular electron transfer at low temperature. Hopping is expected to become important in many media near room temperature, and thus cannot be conclusively ruled out in the reactions of trapped electrons. The tunneling effect in liquids is usualiy small, leading only to the increase of a few angstrom in reaction radius in low viscosity liquids, but tunneling effects can be quite important in overcoming steric hindrance or Coulomb repulsion.

4007 Radiochemistry And Nuclear Chemistry

REFER ALSO TO CITATION(S) 31825, 32189, 32190, 32505, 32535

32228 (AAEC/E—512) Preparation of thin targets of ^{239}Pu, ^{233}U and ^{235}U by the method of electrospraying. Walsh, R.L.; Senior, I.F. (Australian Atomic Energy Commission Research Establishment, Lucas Heights). May 1981. 15p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700247.

The preparation of thin, uniform targets of ^{239}Pu, ^{233}U and ^{235}U by the method of electrospraying is described. The technique has established advantages over other methods of target preparation, for example high deposition efficiency, ease of recovery of unused material and simplicity of operation. These targets are used for neutron-induced fission experiments.

32229 (ARL/TR—034) Quality assurance of radiopharmaceuticals-specifications and test procedures. Baldas, J.; Bonnyman, J.; Pojer, P.M. (Australian Radiation Lab., Melbourne). Aug 1981. 135p. NTIS (US Sales Only), PC A07/MF A01. Order Number DE82700254.

This report is a compilation of test methods used and specifications adopted for the Radiopharmaceutical Quality Assurance Test Programme conducted by the Australian Radiation Laboratory. In some cases test procedures described have been taken from various Pharmacopoeias or methods published in the literature. In other cases test methods have been developed at the ARL.

32230 (DOE/ER/04447—137) Physical-chemical studies of transuranium elements. Progress report, April 1, 1981-March 31, 1982. Peterson, J.R. (Tennessee Univ., Knoxville (USA). Dept. of Chemistry). 1982. Contract AS05-76ER04447. 45p. NTIS, PC A03/MF A01. Order Number DE82006799.

Major advances in our continuing program to determine, interpret, and correlate the basic chemical and physical properties of the transuranium elements are summarized for the period April 1, 1981, through March 31, 1982.

32231 (DOE/EV/10380—2) Development of more efficacious Tc-99m organ imaging agents for use in nuclear medicine by analytical characterization of radiopharmaceutical mixtures. Progress report, May 1, 1981-April 30, 1982. Heineman, W.R.; Deutsch, E.A. (Cincinnati Univ., OH (USA)). Dec 1981. Contract AC02-80EV10380. 53p. NTIS, PC A04/MF A01. Order Number DE82006895.

The objectives of this year's research were to develop a method for rapidly determining TcO_4^- in ^{99}Mo//sup 99m/Tc generator eluates, to improve the ability to chromatographically determine individual Tc-HEDP complexes in radiopharmaceuticals, and to investigate the effects of TcO_4^- concentration and electrochemical reduction on the types and relative amounts of Tc-HEDP complexes present in a radiopharmaceutical formulation. A rapid and sensitive high performance liquid chromatographic (HPLC) method for the quantitative determination of pertechnetate (TcO_4^-) was developed. This HPLC-based analysis may be of considerable utility in assessing the history and function of ^{99}MO/sup 99m/Tc generators as well as in the routine analysis of reduced technetium radiopharmaceuticals for the presence of undesired TcO_4^-. Encouraging results were obtained on a dimethyl amine column using aqueous $(NH_4)_2SO_4$ as the mobile phase. The preparation of Tc($NaBH_4$) HEDP radiopharmaceutical analogues using varying concentrations of total TcO_4^- shows a dramatic effect in the number and distribution of Tc-HEDP complexes over a TcO_4^- concentration range of 10^{-2} to 10^{-6}M. These results suggest that total TcO_4^- concentration is an important parameter to be considered in the preparation of a specific Tc-HEDP complex to improve skeletal imaging. The preparation of Tc(electrode) HEDP radiopharmaceutical analogues by using electrochemical reduction was explored. The resulting solutions contain Tc-HEDP complexes that are tentatively identified as being the same complexes formed by $NaBH_4$ reduction, although the relative concentrations of these complexes are quite different with the two modes of reduction. Thus, electrochemical reduction shows promise as a viable route to the preparation of specific Tc-HEDP complexes for improved skeletal imaging.

32232 (FEI—1094) Model of diffusion of metals. 2. Effect of polymorphic transformations on self-diffusion parameters. Solov'ev, V.A. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Obninsk. Fiziko-Ehnergeticheskij Inst.). 1980. 15p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700248.

The model of metal diffusion which includes assumptions of the existence of local melting regions, is considered. The model is spread on metals characterized by polymorphous transformations. A good agreement of calculated and experimental values of the activation energy of metal self-diffusion is obtained. Self-diffusion activation energies for metals which have no experimental data are calculated. Pre-exponential multiplier for certain metals is estimated and compared with experimental data.

32233 (IA—1364, pp 111-112) Metallic interaction in dioxides with rutile and rutile-related structures. Shimony, Y. (Israel Atomic Energy Commission, Tel Aviv); Ben-dor, L. (Hebrew Univ., Jerusalem (Israel)). Jul 1981. NTIS (US Sales Only), PC A13/MF A01.

In Research laboratories annual report 1980.

32234 (IAEA-CN—40/74P) Preparation of a variety of transuranium nuclides in Oak Ridge facilities. Bigelow, J.E. (Oak Ridge National Lab., TN (USA)). 1981. Contract W-7405-ENG-26. 15p. (CONF-810969—2). NTIS, PC A02/MF A01. Order Number DE82002729.

From IAEA conference; Grenoble, France (28 Sep 1981).

The poster presentation includes brief descriptions of the preparation and applications of ^{240}Pu, ^{244}Pu, ^{243}Cm, ^{245}Cm, ^{248}Cm, ^{249}Cf, ^{254}C, ^{253}Es, and ^{254}Es.

32235 (IEA-DT—141) Uranium dioxide sintering kinetics and mechanisms under controlled oxygen potentials. de Freitas, C.T. (Instituto de Energia Atomica, Sao Paulo (Brazil)). Jun 1980. 174p. NTIS (US Sales Only), PC A08/MF A01. Order Number DE82700272.

Thesis.

The initial, intermediate, and final sintering stages of uranium dioxide were investigated as a function of stoichiometry and temperature by following the kinetics of the sintering reaction. Stoichiometry was controlled by means of the oxygen potential of the sintering atmosphere, which was measured continuously by solid-state oxygen sensors. Included in the kinetic study were microspheres originated from UO_2 gels and UO_2 pellets produced by isostatic pressing ceramic grade powders. The microspheres sintering behavior was examined using hot-stage microscopy and a specially designed high-temperature, controlled atmosphere furnace. This same furnace was employed as part of an optical dilatometer, which was utilized in the UO_2 pellet sintering investigations. For controlling the deviations from stoichiometry during heat treatment, the oxygen partial pressure in the sintering atmosphere was varied by passing the gas through a Cu-Ti-Cu oxygen trap. The trap temperature determined the oxygen partial pressure of the outflowing mixture. Dry hydrogen was also used in some of the UO sub(2+x) sintering experiments. The determination of diametrial shrinkages and sintering indices was made utilizing high-speed microcinematography and ultra-microbalance techniques. It was observed that the oxygen potential has a substantial influence on the kinetics of the three sintering stages. The control of the sintering atmosphere oxygen partial pressure led to very fast densification of UO sub(2+x). Values in the interval 95.0 to 99.5% of theoretical density were reached in less than one minute. Uranium volume diffusion is the dominant mechanism in the initial and intermediate sintering stages. For the final stage, uranium grain boundary diffusion was found to be the main sintering mechanism.

32236 (KAERI/RR—241/80) Dynamics study of AUC precipitation. Studies on the reconversion of UF_6. Chang, I.S.; Chang, K.S.; Park, M.H. (Korea Advanced Energy Research Inst., Seoul (Republic of Korea)). 1980. 29p. (In Korean). NTIS (US Sales Only), PC A03/MF A01. Order Number DE82700252.

The dynamic behaviour of continuous AUC (Ammonium Uranyl Carbonate) precipitation in a circulation mixing MSMPR (Mixed Suspension Mixed Product Removal) crystallizer was studied. Simulating the dynamic crystallization models by the method of moment transformation, the growth and nucleation models of AUC particles were proposed and those reaction constants were determined experimentally. Particularly, nucleation model was in good agreement with experimental result when secondary nucleation caused by mixing energy or else was considered and crystal size distribution of transient state was also calculated semianalytically. For the future practical operation, the properties of the products were investigated by changing the mean residence time which is one of the operating variables.

32237 (UCRL—85944) Chemical properties of the heavier actinides and transactinides. Hulet, E.K. (Lawrence Livermore National Lab., CA (USA)). 1981. Contract W-7405-ENG-48. 39p. (CONF-810948—3). NTIS, PC A03/MF A01. Order Number DE82005701.

From Actinides-1981 conference; Pacific Grove, CA, USA (10 Sep 1981).

The chemical properties of each of the elements 99 (Es) through 105 are reviewed and their properties correlated with the electronic structure expected for 5f and 6d elements. A major feature of the heavier actinides, which differentiates them from the comparable lanthanides, is the increasing stability of the divalent oxidation state with increasing atomic number. The divalent oxidation state first becomes observable in the anhydrous halides of californium and increases in stability through the series to nobelium, where this valency becomes predominant in aqueous solution. In comparison with the analogous 4f electrons, the 5f electrons in the latter part of the series are more tightly bound. Thus, there is a lowering of the 5f energy levels with respect to the Fermi level as the atomic number increases. The metallic state of the heavier actinides has not been investigated except from the viewpoint of the relative volatility among members of the series. In aqueous solutions, ions of these elements behave as a normal trivalent actinides and lanthanides (except for nobelium). Their ionic radii decrease with increasing nuclear charge which is moderated because of increased screening of the outer 6p electrons by the 5f electrons. The actinide series of elements is completed with the element lawrencium (Lr) in which the electronic configuration is $5f^{14}7s^27p$. From Mendeleev's periodicity and Dirac-Fock calculations, the next group of elements is expected to be a d-transition series corresponding to the elements Hf through Hg. The chemical properties of elements 104 and 105 only have been studied and they indeed appear to show the properties expected of eka-Hf and eka-Ta. However, their nuclear lifetimes are so short and so few atoms can be produced that a rich variety of chemical information is probably unobtainable.

32238 Raman spectroscopy study of hydroxo and carbonato species of the uranyl (VI) ion. Maya, L.; Begun, G.M. (Oak Ridge National Lab., TN (USA)). *Journal of Inorganic and Nuclear Chemistry;* **43**: No. 11, 2827-2832(1981).

The Raman spectra of a number of uranyl species in carbonate and alkaline solutions have been obtained as well as those of solids obtained from carbonate media. The frequency of the UO_2-ν_1 symmetric stretching vibration of these species can be used to complement evidence derived by other means in their identification. Thus, the existence of uranyl hemicarbonate, $(UO_2)_2CO_3(OH)_3^-$, has been demonstrated as well as that of anionic hydroxo species, such as $UO_2(OH)_4^{2-}$. The conversion of $UO_2(CO_3)_3^{2-}$ into $UO_2(CO_3)_3^{4-}$ by addition of HCO_3^- was followed by Raman spectroscopy and ^{13}C NMR. Solid solutions with compositions within that of UO_2CO_3 and sodium uranate have been detected. A correlation was observed between the ν_1 frequency and the number and nature of the ligands surrounding the uranyl ion.

32239 Electron paramagnetic resonance and crystal structure study of bis(triphenylphosphine)iminium hexafluorouranate(V). Eastman, M.P. (Texas Univ., El Paso (USA)); Eller, P.G.; Halstead, G.W. (Los Alamos Scientific Lab., NM (USA)). *Journal of Inorganic and Nuclear Chemistry;* **43**: No. 11, 2839-2842(1981).

The new compound bis(triphenylphosphine)iminium hexafluorouranate(V), $(PPN)(UF_6)$, has been synthesized and characterized. The electron paramagnetic resonance (EPR) spectrum of a polycrystalline specimen at 100°K exhibited an unusual non-axial g-tensor. A single crystal X-ray study has shown the structure of $(PPN)(UF_6)$ at room temperature to be triclinic with little crystallographically significant distortion of the UF_6^- octahedron. The average U-F distance is 2.03(2) A. The unusual EPR spectrum thus may be attributed to low site symmetry and/or very small distortions of the UF_6^- octahedron. Crystal data are reported.

32240 Electrochemical and spectroscopic studies of neptunium(VI), -(V) and -(IV) in carbonate-bicarbonate buffers. Wester, D.W.; Sullivan, J.C. (Argonne National Lab., IL (USA)). *Journal of Inorganic and Nuclear Chemistry;* **43**: No. 11, 2919-2923(1981).

The behavior of neptunium(VI), -(V) and -(IV) in carbonate-bicarbonate buffers (1 M) has been examined electrochemically and spectroscopically. Np(VI) undergoes a one-electron quasi-reversible reduction to Np(V) at + 0.22 V vs SSCE. Np(V) is reduced irreversibly to Np(IV) at ca. - 1.8 V. Although Np(V) is readily oxidized to Np(VI), no oxidation of Np(IV) was observed. Spectroscopic results indicate that the Np(VI)-(V) reaction involves one reactant and one product. The spectrum of Np(IV) in 1 M carbonate-bicarbonate has been quantitatively analyzed. Comparisons with results for uranium under similar conditions are presented.

32241 Polymerization of Pu(IV) in aqueous nitric acid solutions. Toth, L.M.; Friedman, H.A.; Osborne, M.M. (Oak Ridge National Lab., TN (USA)). *Journal of Inorganic and Nuclear Chemistry;* **43**: No. 11, 2929-2934(1981).

The polymerization of Pu(IV) in aqueous nitric acid solutions has been studied spectrophotometrically both to determine the effects of large $UO_2(NO_3)_2$ concentrations on the polymerization rates and, more generally, to review the influence of other major parameters on the polymer reaction. Typically, experiments have been performed at 50°C and at 0.05M Pu in aqueous solutions of HNO_3 at concentrations ranging from 0.07 to 0.4M. An induction period usually precedes the polymer growth stage, during which time it is believed that primary hydrolysis products form and begin to aggregate. Uranyl nitrate retards the polymerization reaction by approximately 35% despite the counteracting influence of the nitrate ions associated with this solute. The rate of polymer formation at 50°C has been shown to be third order in Pu(IV) concentration.

32242 Electrochemical studies of trivalent californium and selected trivalent lanthanides in aqueous solutions. Musikas, C.; Haire, R.G.; Peterson, J.R. (Oak Ridge National Lab., TN (USA)). *Journal of Inorganic and Nuclear Chemistry;* **43**: No. 11, 2935-2940(1981).

D.c. polarographic and cyclic voltammetric studies have been carried out on aqueous solutions (10^{-4} to 10^{-3}M) of ^{249}Cf, Sm and Gd. From the present data and the established electrochemical behavior of Sm and Gd, it can be inferred that Cf(III) is reduced in two steps at the mercury-drop electrode, first to Cf(II), followed by the Cf(II) being reduced to Cf(Hg). The potentials for the two electrochemical steps are - 1.47 and - 1.68 V vs NHE, respectively.

32243 Radiopolarography of mendelevium in aqueous solutions. David, F. (Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire); Samhoun, K. (National Council for Scientific Research, Beirut (Lebanon)); Hulet, E.K.; Baisden, P.A.; Dougan, R.; Landrum, J.H.; Lougheed, R.W.; Wild, J.F. (California Univ., Livermore (USA). Lawrence Livermore National Lab.); O'Kelley, G.D. (Oak Ridge National Lab., TN (USA)). *Journal of Inorganic and Nuclear Chemistry;* **43**: No. 11, 2941-2945(1981).

The possible existence of a monovalent ion of mendelevium has been examined further by radiopolarography. Experiments were

conducted in several aqueous media with ^{241}Am, ^{249}Cf, ^{254}Es, sup(255,256)Fm and ^{256}Md tracers. Half-wave amalgamation potentials of Md in tetramethylammonium perchlorate and in LiCl were identical within the experimental errors at - 1.755 +- 0.005 V vs the saturated calomel electrode, in good agreement with an earlier study by radiocoulometry in an ammonium acetate medium. No shift in the half-wave potential of Md was observed due to NH_4^+ or Cl^- ions; hence, these ions do not act as complexing agents for Md ions present during electrochemical reductions. The shift in the half-wave potential observed in the presence of citrate as a complexing agent was characteristic of the reduction process $Md^{3+} \rightarrow Md^0$(Hg). In noncomplexing media, the slope of the logarithmically transformed wave of Md was approximately 30 mV, consistent only with a reversible, two-electron reduction process. All of the results provide evidence for electrochemical reduction of the Md^{2+} ion only and disprove the existence of an intermediate Md^+ ion in aqueous solution with properties like those of Cs^+, Ag^+ or Cu^+.

32244 **Adsorption of technetium on selected inorganic ion-exchange materials and on a range of naturally occurring minerals under oxic conditions.** Palmer, D.A.; Meyer, R.E. (Oak Ridge National Lab., TN (USA)). *Journal of Inorganic and Nuclear Chemistry;* **43**: No. 11, 2979-2984(1981).

The adsorption of Tcsup(95m), as TcO_4^-, on a weakly basic organic ion-exchange resin was studied as a function of pH in 0.1M solutions of Na_2SO_4, NaCl and $NaNO_3$. A similar study was performed with the adsorbents ZrO_2 and Al_2O_3. In addition, adsorption on ZrO_2 was investigated in 0.01 and 0.25M NaCl. An unusual pH profile of the distribution coefficient was found for the polymer, [$(CH_2CH_2O)Cl$]sub(n) in 0.1 and 1M NaCl and 0.1N Na_2SO_4 in as much as the D values increased with pH rather than decreased as was observed in all prior examples. In a number of selected systems, the adsorption of I^{131}, as I^-, was studied to aid in the characterization of the mechanisms. In addition, the adsorption properties of 37 minerals with respect to TcO_4^- were investigated in 0.1M NaCl as a function of pH. For the minerals, montmorillonite, illite, kaolinite and monazite this work was expanded to include 0.01, 1.0 and 4.0M NaCl solutions. In general, the distribution coefficients observed under the oxic conditions employed here were small and could be adequately accounted for by an ion-exchange mechanism.

32245 **Work diagram for plutonium.** Silver, G.L. (Monsanto Research Corp., Miamisburg, OH (USA). Mound Facility). *Journal of Inorganic and Nuclear Chemistry;* **43**: No. 11, 2997-2999(1981).

Predominance region diagrams, as guides to the chemistries of elements in solutions, are described, with reference to the potential-pH diagram. A description is now given of free energy-pH diagrams (referred to as work diagrams). A work diagram for aqueous plutonium is presented, showing how much work must be expended upon one liter of a solution containing one millimole of plutonium, initially in the trivalent state, in order to convert it into some other oxidation state distribution in which another oxidation state predominates. Methods of preparing the diagram, and the thermodynamics involved, are discussed.

4008 Combustion, Pyrolysis, And High-temperature Chemistry

32246 **(DOE/ER/04433—5) Theoretical studies on heterogeneous combustion. Progress report, March 1, 1981-December 15, 1981.** Law, C.K. (Northwestern Univ., Evanston, IL (USA). Dept. of Mechanical and Nuclear Engineering). 1982. Contract AS02-77ER04433. 14p. NTIS, PC A02/MF A01. Order Number DE82006911.

In most of the liquid-fueled chemical power plants the fuel is usually introduced into the combustor in the form of a spray jet consisting of an ensemble of droplets. The spray subsequently ignites and burns, releasing chemical energy to perform work and, at the same time, producing trace pollutants which are subsequently exhausted. In order to improve the combustor performance in terms of cleanliness and efficiency, understanding of the combustion characteristics of fuel spray is essential. The present program aims to study the various heterogeneous processes involved during (1) vaporization, ignition, deflagration, and extinction of single fuel droplets in the reactive environment simulating the spray interior, and (2) the vaporization, ignition, and combustion of the spray as a whole. The approach is primarily theoretical, although occasionally simple experiments have been conducted to complement the theoretical predictions. The following projects were completed this quarter and are described in this report: explosions with chain branching; assessment of importance of gas-phase transient diffusion in droplet combustion; droplet flame structure with combined forced and buoyant convection; and review of articles on droplet vaporization and combustion.

42 ENGINEERING

4201 General Engineering

32247 **Variability of data--standards for applications.** Swindeman, R.W. (Oak Ridge Natl Lab, Tenn). *HTD [Publication] (American Society of Mechanical Engineers);* **47**: 71-94(1981). (CONF-810625—).

From ASME PVP conference; Denver, CO, USA (21 Jun 1981).

Engineering differs from science largely in an attitude of estimating uncertainties due to insufficient information. An in experimental science, there is recognized a standard way of estimating variability so that scientists can exchange their results with confidence. Engineers deal with material property variability all the time but in an ad hoc manner. Insufficient number of tests and misinterpretation of test results can lead to costly repairs or failures. The issue is: should engineers adopt standards to handle material property variability. 12 refs.

4202 Facilities And Equipment

REFER ALSO TO CITATION(S) 31788, 32282

32248 **(BDX—613-2722) Environmental chamber low temperature cutoff. Final report.** Robinson, L.A. (Bendix Corp., Kansas City, MO (USA)). Jan 1982. Contract AC04-76DP00613. 12p. NTIS, PC A02/MF A01. Order Number DE82007626.

Many environmental chambers at Bendix Kansas City use liquid nitrogen as a coolant. The solenoid valves which control the flow of liquid nitrogen periodically fail to close when necessary. Product being tested can then be subjected to damaging environmental stresses. The system developed overcame this problem and appears to be readily adaptable to a wide range of chambers.

32249 (GSI—81-2, pp 180) **Production and application of molecular filters.** Gerhard, A.; Schempp, A.; Klein, H. Mar 1981. NTIS (US Sales Only), PC A16/MF A01.

In Scientific report 1980.

32250 **(INIS-mf—6729) Nonlinear theory of elastic shells.** Costa, J.A. Jr. (Santa Catarina Univ., Florianopolis (Brazil)). Aug 1979. 81p. (In Portuguese). NTIS (US Sales Only), PC A05/MF A01. Order Number DE82780059.

Thesis.

Nonlinear theory of elastic shells is developed which incorporates both geometric and physical nonlinearities and which does not make use of the well known Love-Kirchhoff hypothesis. The resulting equations are formulated in tensorial notation and are reduced to the ones of common use when simplifying assumptions encountered in the specific literature are taken.

32251 **(INIS-mf—6765) Development of a curved beam element model applied to finite elements method.** Bento Filho, A. (Santa Catarina Univ., Florianopolis (Brazil)). Jan 1980. 69p. (In Portuguese). NTIS (US Sales Only), PC A04/MF A01. Order Number DE82780242.

A procedure for the evaluation of the stiffness matrix for a thick curved beam element is developed, by means of the minimum potential energy principle, applied to finite elements. The displacement field is prescribed through polynomial expansions, and the interpolation model is determined by comparison of results obtained

by the use of a sample of different expansions. As a limiting case of the curved beam, three cases of straight beams, with different dimensional ratios are analised, employing the approach proposed. Finally, an interpolation model is proposed and applied to a curved beam with great curvature. Desplacements and internal stresses are determined and the results are compared with those found in the literature. (Author).

32252 (NP—2900949) Manual of the drilling technology. (Wirth Maschinen- und Bohrgeraete-Fabrik G.m.b.H., Erkelenz (Germany, F.R.)). Jan 1979. 320p. (In German). NTIS (US Sales Only), PC A14/MF A01. Order Number DE82900949.

The first chapter presents historical details and the definition of the various drills and drilling methods, whereas, the second chapter mainly contains geological tables (historical time- and information table, cycle of rocks, etc.) as well as information about properties and criteria for drillability of rocks. The third and fourth chapters inform about drilling rigs (according to API and DCDMA) resp. casing tubes/drilling tubes (according to API and DIN) in the way of the known and useful Mannesmann-tables. The chapters are complemented by information on the heavy- and Kelly-rods; besides, for well constructors, on filter pipes and filter gravel according to DIN. Chapter 5, which is dedicated to the drilling tools, presents besides the detailed classification of roller bits other cutting tools for direct or indirect wash drilling, large bore-roller drilling tools and drilling tools for rotary pile drilling tools, besides clearance-tables, instructions and standards for the drill-off test, estimation of economy and optimal drilling tool life. Surely the sixth chapter on the fundamentals of planning will be of special interest to the drilling specialist, it contains monograms, calculation aids, tables and formulas for the determination of all important sizes and data on borehole course, the borehole hydraulics, pump performance, washing treatment, kick prevention and cementation. The manual ends with a small machine and equipment information in chapter 7 and a collection of formulas in chapter 8 as well as a large table of contents.

32253 (PB—81-970073) Cryogenic-container suspension strap: a supporting strap has low thermal conductivity. NTIS Tech Note. (National Aeronautics and Space Administration, Washington, DC (USA)). Apr 1981. 1p. For information about subscribing to Tech Notes, please write NTIS Subscription Dept.

This citation summarizes a one-page announcement of technology available for utilization. A fiberglass/epxoy supporting strap holds the inner shell of a cryogenic storage tank away from the outer shell. The strap, made of two or more links, reduces the heat leakage into the cryogenic fluid more efficiently than conventional suspension systems. The strap is made from a unidirectional fiberglass/epoxy composite material, which has high strength-to-density and strength-to-thermal conductivity ratios at cryogenic temperatures. For additional information, contact: The Patent Counsel, Ames Research Center, Moffett Field, California, refer to ARC-11157.

32254 (UCRL—86438) Motion control system for the Large Optics Diamond Turning Machine (LODTM). McCue, H.K. (Lawrence Livermore National Lab., CA (USA)). 8 Jul 1981. Contract W-7405-ENG-48. 18p. (CONF-8110142—1). NTIS, PC A02/MF A01. Order Number DE82006740.

From Instrument Society of America conference; Anaheim, CA, USA (6 Oct 1981).

LODTM, built by LLNL for DOD, is a precision vertical lathe used to diamond turn large optical parts (to 64" diameter) to 1 μ inch tolerance. The LODTM motion controls require precision sensors, precision servos, and a wideband (100 Hz) real time computer. Position is sensed to 1/40 μ inch resolution by laser interferometers and differential capacitance gauges. Precision servos operating at 1/10 μ inch resolution and at low velocities with zero backlash are required. A unique fast tool servo (FTS), located close to the diamond tool, adjusts the final tool position. The LODTM controls coordinate the X, Z, and FTS servos to cause the tool to move on a specified contour and at a specified feedrate in the X-Z plane. The part tape commands this motion with a linear CNC and real time (32-bit) computer. During each 1 ms sample time, the computer must DMA 13 sensor readings into memory, calculate the X and Z Tool Coordinates, calculate the FTS input, output the following errors, output the FTS input, and check for anomalies.

32255 (Y—2264) Upgrading a production machine tool for precision machining. Barkman, W.E.; Woodard, L.M. (Oak Ridge Y-12 Plant, TN (USA)). 28 Dec 1981. Contract W-7405-ENG-26. 24p. NTIS, PC A02/MF A01. Order Number DE82006017.

This report summarizes the work done to apply state-of-the-art precision-machining technology to an existing machine tool. A two-axis, T-base lathe was retrofitted with air-bearing slides and spindle, laser interferometer feedback, electric drives, a vibration-isolation base, and a computer numerical control system. The resulting contouring capability for a spherical part improved from 4 μm (160 μin.) to 1.27 μm (50 μin.) while the surface finish capability improved from $\sim$ 0.23 μm (9 μin.) to 0.1 μm (4 μin.) peak-to-valley.

32256 (Y/EN—611) Report of investigation, first floor slab in ORNL building 9204-1, Y-12 plant. Burdette, E.G. (Oak Ridge National Lab., TN (USA)). Jul 1981. Contract W-7405-ENG-26. 37p. NTIS, PC A03/MF A01. Order Number DE82007205.

The primary objective of the work reported here was to determine safe allowable axle loads for fork trucks using above grade floors in certain ORNL buildings in the Y-12 area. A necessary part of the accomplishment of this objective was the formulation of a method for assessing the flexural capacity of a slab and for determining the bending moment induced by an applied axle load. A decision was made to focus on a particular slab region on the first floor of Building 9204-1. This slab had one of the lowest allowable axle loads, as determined from earlier analyses, and it was located in an area where the use of 4000-lb fork trucks loaded to capacity was crucial to the performance of the large coil fusion project. Also, it was in a location easily accessible for experimental investigation. The procedure followed to attain the desired objectives was as follows. Load tests on a slab in Building 9204-1 were performed. Two fork trucks, 4000 and 6000-lb capacity, were used. The trucks were loaded to different load levels, the axle loads were obtained by weighing, and the trucks were run, singly, over the slab. Both computer (finite element) and hand analyses were made. Criteria were defined, based on the experimental and analytical studies, to determine a reasonable safe axle load. Finally, a procedure was developed for extending the results to other slabs. The results show no visible evidence of any distress of the slab or beams under any of the loadings, and that the dynamic load factor was approximately 1.05, which is considerably lower than that generally used in design.

32257 Flow-induced tube vibration tests of typical industrial heat exchanger configurations. Halle, H.; Chenoweth, J.M.; Wambsganss, M.W. (Argonne Natl Lab, Ill). *American Society of Mechanical Engineers, [Paper];* No. 81-DET-37, vp(Sep 1981).

The occurrence of potentially damaging tube vibrations as a function of flow rate was investigated experimentally for typical industrial shell-and-tube heat exchanger configurations. The tests used a 0.6-m (24-in.)-diameter, 3.7-m (12-ft)-long heat exchanger shell containing a removable tube bundle whose component tubesheet, baffles, and tubes were readily rearranged or replaced to provide different test even configurations. The heat exchanger was tested with water flow on the shell side to determine a critical threshold, above which a small increase in the flow rate initiates a fluidelastic instability resulting in large amplitude vibration. The locations of the tubes most susceptible to vibration, the vibration frequencies, pressure drop data, and a comparison with Connors' method are presented. 10 refs.

32258 Methods to avoid inadmissibly high final compression temperatures. Hege, H.R. *Klima, Kaelte, Heizung;* **9**: No. 9, 407-409(Sep 1981). (In German).

From 5. colloquium on refrigeration; Budapest, Hungary (1 - 3 Sep 1981).

Extensive computations of loss statistics of semi-hermetical compressors have shown with a surprising as well as frightening distinctness, that inadmissibly overheating of compressors is the most frequent, stand-out case for failures. The author gives some indication on the admissible final compression temperatures as well as suction temperatures, and describes methods for limiting these.

32259 **Fault detection and potential measurements with buried pipes.** Prinz, W. *Three R International;* 20: No. 9, 498-503(Sep 1981). (In German).

With the conventional on-potential, the cathodic protection potential at big fault points of the pipe coating may not be achieved at all times. To secure the cathodic protection and to avoid any influence such fault points have to be located and removed. The author desribes AC- and DC-methods which allow to locate safely fault points in the pipe coating. Furthermore, references are made to voltage drops caused by compensating currents. Thus the off-potential is not equal to the IR-free potential of the fault point. The possibility of determining the pipe-to-soil potential along the pipeline without a connection to the pipe is explained.

32260 **Steam condensation on various gold surfaces.** Woodruff, D.W.; Westwater, J.W. (Univ of Ill, Urbana). *American Society of Mechanical Engineers, [Paper];* No. 81-HT-15; vp(Aug 1981).

Gold surfaces were investigated as promoters of dropwise condensation (DWC) of steam at atmospheric pressure. Very high heat fluxes at low /DELTA/ T's may be achieved in this manner. Seven gold electroplating baths, one electro-less immersion gold plating bath, and vacuum vapor deposition of gold were used. Five different surface preparations for pure gold were tested. Gold deposits ranged in thickness up to 20,000 A.U. Auger electron spectroscopy and scanning electron microscopy were used to describe the surfaces chemically and physically. 19 refs.

32261 **Influence of quality assurance on valve design and manufacture.** Gappisch, M.; Weyand, M. *Three R International;* 20: No. 8, 419-424(Aug 1981). (In German).

The authors present an outline of the approach pursued by valve manufacturers towards quality assurance and what measures they are taking or proposing to take in design and manufacture to achieve an adequate degree of product reliability and freedom from deficiencies in their products. Those measures which valve manufacturers no longer regard as appropriate and necessary in contributing to quality assurance are briefly described.

32262 **Stability and fast heat removal with He-II cooling for pulsed superconductive magnets.** Desportes, H. (CEA Centre d'Etudes Nucleaires de Saclay, 91-Gif-sur-Yvette (France)). pp 148-152 of Superconductive energy storage. Proceedings of the international symposium. Nishimura, M. (ed.). Osaka, Japan; Kuroki Publishing Company (1980).

From International symposium on superconductive energy storage; Osaka, Japan (8 Oct 1979).

The use of pressurized superfluid Helium between 1.6 K and 1.8 K is being considered for a number of superconducting magnet applications. This type of cooling is particularly interesting in the case of pulsed field magnets where large heat fluxes need to be evacuated in a short time. This paper reviews a few recent experiments on heat transport properties and stability in He-II, which contribute to evaluating its potential use for such an application. Present technology is illustrated by the description of a large test facility recently operated at Saclay.

32263 **Cooling of superconducting magnet with superfluid He.** Shigi, T. (Osaka City Univ. (Japan). Dept. of Physics); Yamamoto, J. pp 153-157 of Superconductive energy storage. Proceedings of the international symposium. Nishimura, M. (ed.). Osaka, Japan; Kuroki Publishing Company (1980).

From International symposium on superconductive energy storage; Osaka, Japan (8 Oct 1979).

Heat transport characteristics of subcooled He II confined in a narrow tube were measured at various pressures. Pressure dependence of heat conduction properties is very small. Measured critical heat fluxes are about 20% larger than the values calculated using F(T, Tlambda) function of Bon Mardion, et al. The effective thermal conductivity at 0.27 atm has the maximum value at about 1.9 K. A ^{3}He Joule-Thomson expansion system was considered for refrigerating subcooled He II at 1.8 K. This system is calculated to have a cooling capacity about 10 times larger than that of the conventional ^{4}He pumping, when ^{3}He gas expands from 2 atm to 0.11 atm.

32264 **Stabilization of large superconducting magnets in superfluid helium. Heat transfer aspects.** Van Sciver, S. W. (Wisconsin Univ., Madison (USA)). pp 210-215 of Superconductive energy storage. Proceedings of the international symposium. Nishimura, M. (ed.). Osaka, Japan; Kuroki Publishing Company (1980).

From International symposium on superconductive energy storage; Osaka, Japan (8 Oct 1979).

Stability of large superconducting magnets cooled with superfluid helium (He II) is examined. Impetus for this research is the Wisconsin Superconductive Energy Storage magnet system which proposes to be operated at 1.8 K. A survey of steady state heat transfer in He II is presented in the context of magnet stability. In addition, new results from an experiment to study the transient response of He II show substantially better heat transfer than that of normal helium (He I). For example, a step-function application of heat flux at a rate of 2 W/cm^2 can be absorbed by the helium for about five seconds before film boiling begins. This time delay is caused by the required temperature rise of the He II adjacent to the hot spot. A comparison between the enthalpy rise in the helium and the applied energy shows a close correlation. These new results are discussed in terms of superconducting magnet stability.

4203 Lasers

32265 **XeCl avalanche discharge laser employing Ar as a diluent.** Sze, R.C. (to Department of Energy). US Patent 4,301,425. 17 Nov 1981. Filed date 10 Oct 1979. vp.

PAT-APPL-083508.

A XeCl avalanche discharge exciplex laser which uses a gaseous lasing starting mixture of: (0.2%-0.4% chlorine donor/2.5%-10% Xe/97.3%-89.6% Ar). The chlorine donor normally comprises HCl but can also comprise CCl_4 CCl_3. Use of Ar as a diluent gas reduces operating pressures over other rare gas halide lasers to near atmospheric pressure, increases output lasing power of the XeCl avalanche discharge laser by 30% to exceed KrF avalanche discharge lasing outputs, and is less expensive to operate.

32266 **Repetitively pulsed sealed-TE CO_2 laser using an oxygen tolerant discharge scheme.** Dyer, P.E.; Monk, P. *Applied Physics, [Part] B: Photophysics and Laser Chemistry;* 26: No. 3, 169-172(Nov 1981).

A repetitively pulsed (<= 40 Hz) TE CO_2 laser using an oxygen tolerant discharge scheme is described. Long lived (> 10^5 shots) stable discharges at high pump energy density (approx. equal to 200 J x $l^{-1}atm^{-1}$) have been achieved both with and without the use of additive gases.

32267 **Simple method for single-frequency operation and stabilization of a He-Ne laser.** Kauppinen, J. *Applied Physics, [Part] B: Photophysics and Laser Chemistry;* 26: No. 3, 193-195(Nov 1981).

A simple method for single-frequency operation and stabilization of a low power He-Ne laser has been described and used. With a proper resonator length very weak sideband modes on each side of the strong mode produce a feedback signal to a piezoelectric pusher which controls the resonator length. The long-term frequency stability was estimated to be about +-10 MHz.

32268 **Self-supporting laser diffuser flow energizer.** Hasinger, S.H. US Patent Application 300,763. 10 Sep 1981. 16p.

A self-supporting laser diffuser flow energizer is described for improving the performance of radial flow lasers by providing novel means for pressure recovery, and comprises a self-sustaining suction means communication with the laser cavity for changing the supersonic shock front configuration existing within a radial

laser diffuser and thereby promoting the flow of gaseous laser medium within the laser cavity.

32269 **Optimization of the uv CuII Laser.** Eichler, H.J.; Koch, H.; Molt, R.; Qiu, J.L.; Martin, W. *Applied Physics, [Part] B: Photophysics and Laser Chemistry;* 26: No. 1, 49-56(Sep 1981).

The cw output power of the uv CuII laser has been optimized with respect to the hollow cathode geometry, the discharge current, the fill gas pressure and the resonator mirror parameters. A maximum laser output power of 900 mW for multiline operation at 248.6, 259.1, 260.1, and 270.3 nm was achieved with 100 A discharge current, 260 V voltage and 16 mbar fillgas pressure, when a hollow cathode of 1.2 m length and 2 x 6 mm^2 cross section was employed. The single-pass gain has been estimated to 7%. A hollow cathode cross section of 1.5 x 4.5 mm^2 is suggested as an optimum geometry. In addition, some investigations on the mechanism of the laser power decay in Ne-Cu-discharges are presented.

32270 **Model for diffuse breakdown in high pressure gases with uniform electric fields strengths.** Guendel, H. *Beitraege aus der Plasmaphysik;* 21: No. 6, 393-402(1981).

A model of the breakdown in high pressure gases is presented taking into consideration the finite voltage rise time at the discharge electrodes and a finite initial charge carrier density in the gap. Several types of breakdown could be distinguished which are important for several applications. Thus, the range of existence of high pressure laser discharges at a given preionization density and circuit parameters can be calculated. Moreover, the change in the breakdown characteristics of high pressure gases at high temperatures is explained. This behaviour seems to be important for understanding the physical processes in circuit breaker chambers.

32271 **Free electron laser employing an expanded hollow intense electron beam and periodic radial magnetic field.** Schlesinger, S.P. US Patent Application 092,801. 9 Nov 1979. 15p.

The generation of very high power pulses of coherent electromagnetic radiation that are continuously tunable in frequency is accomplished by means of a free electron laser in which a hollow relativistic electron beam is projected along the longitudinal axis of an evacuated drift tube. A first magnetic field expands the electron beam into an annular peripheral interaction region of the drift tube where the beam interacts with a second periodic radial magnetic field. Frequency is varied by changing the electron velocity of the electron beam or by changing the periodicity of the radial magnetic field. The device can be made to operate as an oscillator by the inclusion of resonant cavity defining mirrors within the interaction region, or as an amplifier by injecting a coherent radiation signal into the interaction region. Both oscillator and amplifier functions can be incorporated into a single device. Linewidth is narrowed by utilizing a Smith-Fox interferometer to couple the generated coherent radiation into an output light pipe.

4204 Heat Transfer And Fluid Flow

REFER ALSO TO CITATION(S) 31814, 31947, 31981, 31982, 31991, 32016, 32045, 32124, 32257, 32258, 32312, 32720

32272 **(KFK—3142) Numerical investigation of natural convection in a Hele-Shaw gap heated from below.** Guenther, C. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Inst. fuer Reaktorbauelemente). Mar 1981. 59p. (In German). NTIS (US Sales Only), PC A04/MF A01. Order Number DE82780257.

Small vertical Hele-Shaw-cells heated from below have been investigated recently by several experiments. The experiments are revealing interesting sequences of various convection modes of the fluid flow for certain regions of supercritical Rayleigh-numbers Ra. The present paper describes a numerical study of the natural convection in a Hele-Shaw-cell; this cavity is of rectangular shape with aspect ratios H/2d = 22.3 and A = H/L = 3.5. This is accomplished by using a computer code which solves the equations of the problem by a finite difference method. Intorducing a parabolic approach for the dependence of the fluid flow on the Z-coordinate (direction of the smallest dimension of the cavity), a two-dimensional model of the problem is obtained with either a viscous and also a quasiporous friction term in the momentum equations. The computational method is shown to be appropriate to calculate the occuring transient natural convective flows. The analysis of the properties of the symmetry of the calculated solutions is yielding the bifurcations of the problem up to 16 times the critical Rayleigh number. For a certain region of Ra, there are two different stable solutions for a given Ra, one which is a stationary solution and another which is an oscillating periodical one. The decrease of the dimensionless period of the oscillatory solutions with increasing Ra is found to be in semi-quantitave agreement with experimental findings. Altogether there is an at least qualitive agreement with experimental results.

32273 **(KFK—3163) Velocity and temperature profiles in rough annuli.** Meyer, L. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Inst. fuer Neutronenphysik und Reaktortechnik). Apr 1981. 90p. NTIS (US Sales Only), PC A05/MF A01. Order Number DE82780258.

Velocity and temperature profiles were measured in an annular flow cross section. Three different rough rods in two outer tubes each were investigated. The slopes of the nondimensional logarithmic velocity profile in both the inner rough zone and the outer smooth zone vary with the Reynolds number. The slopes of the nondimensional temperature profile deviate from a logarithmic line in a large portion of the flow cross section. The turbulent Prandtl number is smaller than one and varies with the distance from the wall.

32274 **(KFK—3164) Heat transfer and pressure drop at single rods with three-dimensional roughnesses. Large scale tests.** Meyer, L. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Inst. fuer Neutronenphysik und Reaktortechnik). Apr 1981. 228p. NTIS (US Sales Only), PC A11/MF A01. Order Number DE82780259.

The results from heat transfer and pressure drop measurements at five single rods with two types of three-dimensional roughnesses on four outer tubes are reported. The friction factors and Stanton numbers were tranformed to the boundary conditions of the rough wall by different methods. A new simple method to transform the Stanton number is proposed. Stanton numbers measured in different outer tubes, transformed to a common flow cross section are a function of the wall Reynolds number only. The tested three-dimensional roughnesses showed considerably higher thermal performances than two-dimensional roughnesses.

32275 **(KFK—3165) Heat transfer and pressure drop at single pins with three-dimensional roughnesses.** Meyer, L.; Neu, W. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Inst. fuer Neutronenphysik und Reaktortechnik). Apr 1981. 48p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE82780260.

Pressure drop and heat transfer measurements were performed with air with two single rods with 8 mm diameter in two different outer tubes. The rods were roughened with different three-dimensional roughnesses similar to those used in large scale tests. The results showed similar high friction factors and Stanton numbers as it was found for the large scale roughnesses. The thermal performance (St^3/f) is higher by approximately a factor of two compared with two-dimensional roughnesses.

32276 **(LA—8872) VNAP2: a computer program for computation of two-dimensional, time-dependent, compressible, turbulent flow.** Cline, M.C. (Los Alamos National Lab., NM (USA)). Aug 1981. Contract W-7405-ENG-36. 208p. NTIS, PC A10/MF A01. Order Number DE82007360.

VNAP2 is a computer program for calculating turbulent (as well as laminar and inviscid), steady, and unsteady flow. VNAP2 solves the two-dimensional, time-dependent, compressible Navier-Stokes equations. The turbulence is modeled with either an algebraic mixing-length model, a one-equation model, or the Jones-Launder two-equation model. The geometry may be a single- or a dual-flowing stream. The interior grid points are computed using the unsplit MacCormack scheme. Two options to speed up the calcula-

tions for high Reynolds number flows are included. The boundary grid points are computed using a reference-plane-characteristic scheme with the viscous terms treated as source functions. An explicit artificial viscosity is included for shock computations. The fluid is assumed to be a perfect gas. The flow boundaries may be arbitrary curved solid walls, inflow/outflow boundaries, or free-jet envelopes. Typical problems that can be solved concern nozzles, inlets, jet-powered afterbodies, airfoils, and free-jet expansions. The accuracy and efficiency of the program are shown by calculations of several inviscid and turbulent flows. The program and its use are described completely, and six sample cases and a code listing are included.

32277 **(NP—2901095) Calculation of the flow in axial-flow compressors by means of a 2-dimensional method, considering the flow in the side-wall boundary layer and the secondary flow.** Huevel, B. (Stuttgart Univ. (TH) (Germany, F.R.)). 15 Feb 1980. 125p. (In German). NTIS (US Sales Only), PC A06/MF A01. Order Number DE82901095.

Thesis.

A two-dimensional computing method is established by which the flow in multi-stage axial-flow compressors operating in the subsonic and transsonic range can be determined. The method contains the calculations for the main, side-wall boundary layer and secondage flow.

32278 **Determination of critical boiling conditions within the whole steam content range for internal pipe flow.** Drescher, G.; Koehler, W. *Brennstoff-Waerme-Kraft;* **33**: No. 10, 416-422(Oct 1981). (In German).

The article describes a method for the determination of the critical boiling conditions in evenly heated vertical pipes with upwards flow. By combining suitable equations for the boiling crisis of the first kind (film boiling) and the second kind (drying-out of the heating surface), it becomes possible to include the whole steam content range. The method was checked by 3044 test points, with an average value of 0.99 and a standard variation of 0.16 for the relative heat flow density in the range of the boiling crisis of the first kind, and an average variation of 0.04 and a standard variation of 0.10 for the variation of the steam content in the range of the boiling crisis of the second kind.

32279 **Measurement of local velocity in water with hot wire anemometers.** Goettling, D.R. *HLH, Heizung, Lueftung, Klimatechnik, Haustechnik;* **32**: No. 10, 407-409(Oct 1981). (In German).

One method of measuring the local velocity in water is the application of hot wire anemometers. The probe of the anemometer has to be tested before insertion in order to enable the evaluation of the results of measurements. The author reports on research work concerning probes with steel pipe jacketing at water velocities up to 1 m/sec and particularly discusses the connection between measuring signal and flow direction.

32280 **Thermodynamic characteristics of the ternary substance system methanol-lithium bromidee-zinc bromide.** Renz, M. *Klima, Kaelte, Heizung;* **9**: No. 9, 411-414(Sep 1981). (In German).

The results of measurements on the binary system methanol-zinc bromide and the ternary system methanol-lithium bromide-Zincbromide are reported. A comparision is made of the important characteristics between some of the absorption processes.

32281 **Methods to calculate equilibrium tray.** Ketchum, R.G.; Jakob, C.H. *Verfahrenstechnik (Mainz);* **15**: No. 8, 548-552(Aug 1981). (In German).

Several years of experience have shown that the Newton-Raphson-Method , combined with a relaxation method, is best suited for flash calculations. Its insensitivity to the quality of the starting values and a stable, smooth convergence behavior render it effective for use in process simulation programs of every kind.

32282 **Heat transfer between particles and fluid in aerated beds.** Riquarts, H.P. *German Chemical Engineering (English Translation);* **3**: No. 5, 286-295(Oct 1980).

From Annual meeting of chemical engineers. 219. meeting of the European Federation of Chemical Engineering; Nuernberg, Germany, F.R. (26 - 28 Sep 1979).

Heat transfer between the particles and the fluid in aerated beds has for a considerable time been the subject of numerous investigations. Of particular interest is the region of low Reynolds numbers for which values of heat transfer coefficients much lower than those corresponding to single particles have been published. This behaviour is investigated here with the aid of energy balances for the solid and the fluid phases. It is of special importance to include in the balance equations heat flow rates originating from the dispersion processes, i.e. those based on the bed conductivity, and also flow rates resulting from the stochastic fluid motions occurring during the passage through the bed.

4205 Materials Testing

REFER ALSO TO CITATION(S) 31908, 32013, 32042, 32247, 32259, 32261

32283 **(Juel-Spez—88) Sound monitoring for detection of pipe ruptures.** Jonas, H.; Herzog, W. (Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.). Inst. fuer Reaktorentwicklung). Sep 1980. 62p. (In German). NTIS (US Sales Only), PC A04/MF A01. Order Number DE82780100.

Experimental investigations on detection of pipe ruptures using monitoring of airborne sound are reported. An observation of high pressure pipes in steam and feedwater circuit is possible, also in the presence of a high-background noise.

32284 **Single crystal metal wedges for surface acoustic wave propagation.** Fisher, E.S. (to Department of Energy). US Patent 4,313,070. 26 Jan 1982. Filed date 9 May 1980. vp.

PAT-APPL-148313.

An ultrasonic testing device has been developed to evaluate flaws and inhomogeneities in the near-surface region of a test material. A metal single crystal wedge is used to generate high frequency rayleigh surface waves in the test material surface by conversion of a slow velocity, bulk acoustic mode in the wedge into a rayleigh wave at the metal-wedge test material interface. Particular classes of metals have been found to provide the bulk acoustic modes necessary for production of a surface wave with extremely high frequency and angular collimation. The high frequency allows flaws and inhomogeneities to be examined with greater resolution. The high degree of angular collimation for the outgoing ultrasonic beam permits precision angular location of flaws and inhomogeneities in the test material surface.

32285 **Nondestructive tests on soldered joints.** Echterhoff, U. *Qualitaet und Zuverlaessigkeit;* **26**: No. 10, 310-314(Oct 1981). (In German).

The significance of the joining method 'soldering' is explained by the many advantages in the economic processing of new materials and material combinations in modern constructions. It is the task of material testing to substantiate the performance and the quality of soldered joints. In the nondestructive testing methods various ultrasonic methods can be used for proving the quality. A pre-condition for this is the observation of certain limiting conditions subject to the process.

32286 **Quality assurance through jurisdiction.** Wittmann, F.J. *Qualitaet und Zuverlaessigkeit;* **26**: No. 10, 324-327(Oct 1981). (In German).

This report discusses the new version of 1979 of the 'Machine Protection Act' of 1968. The reference to the 'generally acknowledged rules of technology' is not problem-free. The Act is connected to EC-guidelines the structure of which is described. This connection leads to a complex of regulations difficult to understand. The consequences which follow any infringement of the law are described.

32287 **Reminiscence of the beginning of the gammma-radiography.** Riehl, N. *Materialpruefung;* **23**: No. 9, 309-313(Sep 1981). (In German).

It is very interesting to recollect the situation of radioactivity and its application in those days. After 1945 a sort of technical inferiority complex had spread out in Germany. If it was the question of pioneering work, one often did nothing but look to America - and often this was justified. As the present paper shows, however, gamma-radiography was first applied in Germany.

32288 **Usefulness of energy measurements in industrial applications of acoustic emission.** Guilliani, L. *Materialpruefung;* **23**: No. 9, 307-309(Sep 1981).

In recent years Acoustic Emission (A.E.) has found much interest as a new non-destructive technique because it offers as unique features the possiblity of following metallurgical phenomena in real time and of locating defects in large structures. Interpretation of A.E. data has been largely dependent on new concepts developed by fracture mechanics theories while the A.E. method seems ideally suited to verify such theories. Much emphasis has been given to development of A.E. as a method to locate defects during hydrotesting of large vessels, especially those intended for nuclear use.

32289 **Testing of welds in hot state with a penetrant for high temperatures.** Riess, N. *Materialpruefung;* **23**: No. 9, 305-306(Sep 1981). (In German).

The penetration test is one of the most effective methods of detecting cracks, overlappings and other defects connected with the surface. This is true, no matter if the material is iron or non-iron metal. There are limits to this method, however, if flaws have to be found in the range below 0°C or above 50°C.

32290 **Effects at the extension of short ultrasonoic pulses in scattering materials.** Hecht, A.; Cherian, P.; Neumann, E.; Mundry, E. *Materialpruefung;* **23**: No. 9, 301-304(Sep 1981). (In German).

This paper reports investigations on the propagation of scattered ultrasound in a test specimen of grain size ASTM 4 (D = 100 μm) in the frequency range 4 to 10 megacycles. It is found that in the Rayleigh region for D/lambda above about 0.1, multi-scattering effects must not be neglected.

32291 **Statistical sputtering contribution to resolution in concentration-depth profiles.** Seah, M.P.; Sanz, J.M.; Hofmann, S. *Thin Solid Films;* **81**: No. 3, 239-246(24 Jul 1981).

The statistical contribution to resolution in concentration-depth profiles by sputtering combined with Auger electron spectroscopy and secondary ion mass spectrometry is evaluated using a modified form of the sequential layer sputtering model. The modification makes allowance for the fact that each surface atom has a sputtering probability which is inversely proportional to its instantaneous bonding with the matrix, as predicted by Sigmund's theory, instead of being constant. Thus the sputtering is site dependent with the most exposed atoms having the highest sputtering probability. The theory shows that the statistical contribution to the depth resolution for depths greater than 10 nm is approximately constant and, depending on the precise choice of parameters, will probably be in the range 1-2 nm instead of increasing with the square root of depth. Thus the statistical contribution, instead of being the dominant term in the resolution of concentration-depth profiles, may often have only a minor effect when compared with the atomic mixing, diffusional and instrumental terms.

32292 **Influence of detecting unit sensitivity upon the recording of acoustic emission signals.** Racko, D. *Materialpruefung;* **23**: No. 7, 231-234(Jul 1981). (In German).

Acoustic emission (AE) has the character of elastic waves of high frequency and low amplitude in nearly all cases, so that it can hardly be observed without good electronic equipment. The quality of the apparatus is assessed according to the capability of guaranteeing the detection of low level signals and simultaneous preventing interference from mechanical or electrical sources, which can have a decisive effect on exact reproduction for the character of the detected sound emission signals. Amplitude discrimination is an effective means for removing undesirable interference, which works on the principle of using the different amplitudes of desirable and undesirable signals. A condition for this is the possibility of changing the sensitivity of the detecting apparatus. By setting on certain voltage amplifiication of the detection apparatus, the signals from the undesirable sources, whose amplitude does not reach the set threshold level, are filtered and only the acoustically emitted signals from the examined process are recorded. The signals from the process examined are, however, influenced by movement of the threshold level. The extent of this effect is analysed in this article.

32293 **X-ray-measurable deformations in superficial layers and their representations.** Lode, W.; Peiter, A. *Materialpruefung;* **23**: No. 7, 227-230(Jul 1981). (In German).

Carrying on the research of the influence of the deformation fields on the distribution of X-ray measurements, the linearly variable field is examined. After review of the different forms of representation, the relations with the matrix, the deformation figure and the epsilon-sin²psi-distribution is explained. It is shown that constant and declining fields and variations in x- and y-direction cause characteristic distributions of the measurements, which are not verifiable with the so called epsilon-sin²psi-method.

32294 **Sound emission analyses used for material tests.** Mosle, H.G. *Maschinenschaden;* **54**: No. 5, 168-170(1981). (In German).

With sound emission analysis one can register: cracks in material, developing leaks in liquid containers, cracks occurring while welding as well as the coming apart of glued material and coatings.

4206 Safety Engineering

REFER ALSO TO CITATION(S) 31790, 32066

32295 **Rehabilitation, reinforcement and safety of steel structures.** Hippauf, K.H. *VGB Kraftwerkstechnik;* **61**: No. 3, 253-257(Mar 1981). (In German).

Following a brief review of the rehabilitation work on the coal conveyor system at Frimmersdorf, the characteristics of steel as a construction material are described. The second section of the paper describes several practical examples of how solutions are possible in reinforcement and modification work on steel structures and indicates the time-scales required. In conclusion general reference is made to the safety of steel structures.

32296 **Reliability and availability of power plant systems.** Uebing, D. pp 135-138 of Technische Zuverlaessigkeit. Ihre Verwirklichung unter den Bedingungen der Zukunft. Duesseldorf, Germany, F.R.; VDI-Verlag (1981). (In German)

From 11. meeting - how to achieve technical reliability under conditions relating to the future; Nuernberg, Germany, F.R. (13 - 15 May 1981).

Industrial-scale plants are a great hazard to man and environment. It will never be possible to avoid this hazard, however, there are methods of systems engineering which may design the complex cybernetic system of man and machine in a rational way.

32297 **Data inaccuracies in reliability calculations of technical systems.** Edwin, K.W.; Siemes, B. pp 153-160 of Technische Zuverlaessigkeit. Ihre Verwirklichung unter den Bedingungen der Zukunft. Duesseldorf, Germany, F.R.; VDI-Verlag (1981). (In German)

From 11. meeting - how to achieve technical reliability under conditions relating to the future; Nuernberg, Germany, F.R. (13 - 15 May 1981).

Data inaccuracies in reliability calculations of technical systems require closer consideration as this is the only way to avoid wrong decisions. This problem has been well known for quite a time. The first publications in this field have discussed the problem of how the inaccuracies in the results can be determined for a given inaccuracy of the initial data. However, there is still the question of how these inaccuracies can be quantitatively determined when determining the initial data. This is the topic discussed in the article. The main initial component parameters, i.e. 'expectation values' and 'probabilities', will receive closer attention. A final example shows the resulting inaccuracies and their consequences in reliability calculations for a redundant transformer array with the aid of Markovian processes.

32298 **Safety and technical reliability.** Grams, T. pp 179-182 of Technische Zuverlaessigkeit. Ihre Verwirklichung unter den Bedingungen der Zukunft. Duesseldorf, Germany, F.R.; VDI-Verlag (1981). (In German)

From 11. meeting - how to achieve technical reliability under conditions relating to the future; Nuernberg, Germany, F.R. (13 - 15 May 1981).

Among the main parameters influencing the safety of a technical installation are the circuiting techniques and systems structures, operating and environmental conditions, type and quality of the structural elements used, and maintenance and repair measures.

32299 **State of the art of standardization of reliability terminology.** Gross, H. pp 183-187 of Technische Zuverlaessigkeit. Ihre Verwirklichung unter den Bedingungen der Zukunft. Duesseldorf, Germany, F.R.; VDI-Verlag (1981). (In German)

From 11. meeting - how to achieve technical reliability under conditions relating to the future; Nuernberg, Germany, F.R. (13 - 15 May 1981).

Standardisation in the field of safety terminology is getting increasing national and international attention. While the main drawback of the past have been faults and omittances in definition, there are parallel activites by different groups, which may again cause uncertainties and inaccuracies. To avoid this, cooperation is indispensable. All users are asked to contribute their observations and practical experiences.

32300 **Application of reliability theory in structural mechanics.** Schueller, G.I. pp 197-201 of Technische Zuverlaessigkeit. Ihre Verwirklichung unter den Bedingungen der Zukunft. Duesseldorf, Germany, F.R.; VDI-Verlag (1981). (In German)

From 11. meeting - how to achieve technical reliability under conditions relating to the future; Nuernberg, Germany, F.R. (13 - 15 May 1981).

It is shown that conventional methods of reliability theory, originally developed for electronic or mechanical components, cannot be directly applied to the problems of structural mechanics. Examples are given to show that failure rates of certain structural components can be predicted only with the aid of analytical methods. Methods of calculation are presented that are suitable for determining failure probabilities of redundant structures in consideration of load shifts.

32301 **Avoiding static charges in filter materials by using metal fibres.** Vansteenkiste, P. *Chemische Technik (Leipzig);* **9**: No. 7, 357-360(Jul 1980). (In German).

From Meeting of the Fibre Society and of the Filtration Society; Princeton, NJ, USA (Nov 1979).

Many official reports lead to the conclusion that at least 10% of all dust explosions are caused by electrostatic discharge. Nobody however can say how many of the remaining accidents can be traced back to electrostatic processes. Fine rust-free metal fibers, incorporated in filters by known methods, are an effective method of eliminating the electrostatic risk in dust filter systems. The effectiveness of this method is shown and how the discharge effect occurs is explained.

4207 Vacuum Engineering

REFER ALSO TO CITATION(S) 32329

4208 Electronic Circuits And Devices

REFER ALSO TO CITATION(S) 31886, 31887

32302 (GSI—81-2, pp 178) **Preparation of superinsulating surfaces by the nuclear track-technique.** Fischer, B.E.; Albrecht, D.; Spohr, R. Mar 1981. NTIS (US Sales Only), PC A16/MF A01.

In Scientific report 1980.

32303 (SAND—82-0425, pp 117-124) **Universal high temperature CMOS logic.** Falater, S.L. (Harris Semiconductor, Melbourne, FL). Feb 1982. NTIS, PC A09/MF A01.

From IEEE high temperature electronics and instrumentation conference; Houston, TX, USA (7 Dec 1981).

A high temperature CMOS logic family consisting of user configurable parts using power switching is described. Expected typical performance parameters are presented. Application examples of the proposed configurations are described.

32304 **(UIUCDCS-R—81-1072) Numerical simulation of semiconductor devices.** Slamet, S. (Illinois Univ., Urbana (USA). Dept. of Computer Science). Sep 1981. Contract AS02-76ER02383. 53p. (COO—2383-0081; UIUC-ENG—81-1722). NTIS, PC A04/MF A01. Order Number DE82005330.

An extension of Gummel's method to calculate the electron density and the potential in unipolar devices is presented. How Gummel's algorithm is implemented to solve the system of partial differential equations is explained. The current continuity equation is solved directly to obtain the electron density. Some comparisons with the stream function method to solve the current continuity equation are also discussed. It should be noted that the stream function method can only be used for time-independent problems with no recombination or generation terms included, whereas the method described can be generalized to time-dependent problems or problems with recombination and generation terms included. Finally numerical results for a standard MOSFET and JFET are given.

4210 Combustion Systems

REFER ALSO TO CITATION(S) 31741, 32246, 32311

32305 **(DOE/MC/14036—T1) Coupling of transport and chemical processes in catalytic combustion. Final report.** Bracco, F.V.; Curtis, P.M. (Princeton Univ., NJ (USA). Dept. of Mechanical and Aerospace Engineering). 30 Nov 1981. Contract AC21-80MC14036. 133p. (FE—2762-8). NTIS, PC A07/MF A01. Order Number DE82006267.

The objective of this program was the elucidation of the mechanism of high temperature catalytic oxidation of elementary hydrocarbon fuels and fuel constituents. Extensive experimental data encompassing a wide range of combustor operating conditions has been obtained for comparison with and development of a computer model of catalytic combustion. The model is two-dimensional steady-state, and includes axial and radial convection and diffusion of mass, momentum and energy, as well as homogeneous (gas phase) and heterogeneous (gas-surface) single-step irreversible chemical reactions. Measured substrate temperatures are input in lieu of complete coupling of gas and solid energy conservation equations, and the model predicts axial and radial gas temperature and composition profiles within a catalyst channel, for comparison with experimental measurements at the catalyst outlet. The effects of radiative heat transfer and the temporal response of the catalyst at ignition have also been incoprorated in the model. The ability to predict the latter is of great importance in practical applications where thermal shock is a major source of mechanical catalyst failure. Experimental investigations were made of carbon monoxide and medium-Btu gas combustion in the presence of a platinum catalyst supported on a monolithic cordierite honeycomb substrate. Axial profiles of substrate temperature, gas temperature and gas composition were determined at different gas velocities, equivalence ratios and inlet preheat temperatures. Design considerations and a summary of manufacturing progress are given for the develoment of a new monolithic catalytic material.

32306 **Operating experience gained with slag tap furnaces.** Glahe, E. *VGB Kraftwerkstechnik;* **60**: No. 10, 777-780(Oct 1980). (In German).

General statements are made on the operation of slag tap furnaces on the basis of experience with forced-circulation steam generators and the dual-stage slag-tap fired boiler with auxiliary oil firing system, Benson system.

32307 **(NP—2900612) Straw as energy source.** Leire, R. (Bengt Dahlgren AB, Helsingborg, Sweden). [nd]. 18p. (In Swedish). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82900612.

The report describes practical measurements when fuelling the central heating system of a farm with straw. The amount of heat which was obtained by combustion of straw was measured to between 2.3 and 2.95 kWh per kg dry substance (T.S). Straw from oleiferous plants yields 3.2 kWh per kg T.S. Swedish farming uses approximately 650000m³ oil as fuel which corresponds to 6 TWh per year. The surplus straw represents at least 10 TWh disposable energy source. The ashes of straw amount to between 3% and 5.5% of T.S. and can be used as fertilizer. Experimental plants of this kind are considered to increase the interest in some other fuels than oil.

4220 Underground Engineering

32308 **Trends of development in opencast mining at increased diesel prices.** Kutschera, S. *Erzmetall;* **34**: No. 10, 547-552(Oct 1981). (In German).

Hard rock open-pit mines using conventional truck haulage are hard hit by rising Diesel fuel prices. Therefore, other methods of transporting material have to be considered. While trolley-assisted trucks are used in exceptional cases, belt conveyors or pipelines seem to be the usual answer. Cost comparisons between conventional truck haulage and systems consisting of small fleets, semi-mobile crushers and belt conveyors show considerably lower operating costs for the latter; an additional advantage being the flexibility of truck haulage over short distances and the low operating costs of belt conveyors for the major part of the haul profile. Pipeline transport from open-pit to processing plant using semi-mobile crushers and semi-mobile mills for grain size reduction could be another solution. As conventional ball mills are too heavy to be semi-mobile, the recently developed Lurgi centrifugal mills, characterized by high capacity, very small dimensions and low capital cost, represent a plausible alternative. German soft rock open-pit technology with bucket wheel excavators, shiftable belt conveyors and spreaders operating in conjunction with draglines will be the answer for large strip mines, reducing expensive scraper operation and increasing dragline productivity. Development of bucket wheels for digging harder material is in progress.

32309 **Measurements of impedances for determinating the minimum short-circuit current in main systems 500 V of underground mining establishments.** Rittinghaus, D. *ETZ Archiv;* **3**: No. 9, 319-323(Sep 1981). (In German).

The complex short-circuit impedances of energized low-voltage main systems were measured with a double-bridge in underground mining operation. The magnitude of the short-circuit currents depends on these impedances. Customary calculations of such currents depend on empirical approximations. To verify the accuracy of these approximations, the measured impedances of 61 nodes in three different main systems were compared with the results of the calculations. The comparison made between the short-circuit currents determined by measurable quantities and the values calculated according to VDE 0118 shows that the stipulated coefficients for calculating the minimum short-circuit currents lie very far on the safe side. An amendment for calculating the short-circuit in accordance with VDE 0118 is therefore suggested.

32310 **Recent developments in automatic hauling winches.** Berger, G.; Buchmeier, W. *Technische Mitteilungen AEG-Telefunken;* **71**: No. 1@2, 50-54(May 1981). (In German).

Recent developments in the GEAMATIC 2000i automation system have also influenced the concept of automatic hauling winches. The intrinsically safe, stored-program control system LOGISTAT CP 80-A800 and the depth indicator also equipped with a microprocessor complement the systems built so far. The paper discusses the role of the LOGISTAT CP 80-A800 control system and the depth indicator in underground automatic hauling winches.

4230 Marine Engineering

REFER ALSO TO CITATION(S) 31752

4240 Pollution Control Equipment

32311 **Trade-offs in NO/sub x/ control.** Whitaker, R.; McElroy, M.; Miller, M. *EPRI (Electric Power Research Institute) Journal;* **7**: No. 1, 18-25(Jan 1982).

Further reduction in nitrogen oxides (NO/sub x/) emissions may be technically feasible, but the cost of more stringent flue gas regulations may not be justified. Power plant NO/sub x/ emissions are easier to regulate than those from automobiles. Design and operating changes in utility furnaces and boilers to control emissions are not as evident as other kinds of pollution control equipment, but the increased use of coal and concerns about acid rain may change that. New research on the chemical treatment of flue gas is looking at selective catalytic reduction (SCR) with ammonia. Other programs are studying the origins and transport of NO/sub x/ to identify new opportunities for control as well as new furnace modifications and burner retrofit measures. The transfer of Japanese control technology has been slow partly because of differences in regulations and maintenance practices. 2 figures. (DCK)

32312 **New look at evaporative gas cooling and conditioning in the cement industry.** Raring, D.L. *Zement-Kalk-Gips;* **34**: No. 10, 491-498(Oct 1981). (In German).

Although evaporative coolers and conditioners have existed in the cement industry for many years, they have been a constant source of problems that cause plant managers and filter manufacturers alike to fear the words 'water sprays'. The reason is two-fold: first, precise quantitative data required to properly size conditioning towers have never been available and second, spray nozzles generally available to designers have lacked the very basic qualities required for good, reliable, gas conditioning systems. The paper discusses improved evaporative conditioning method and identifies cement plant problems where it may be most beneficial. The paper also discusses the relationship of cooling towers on exhaust gases and electrostatic precipitator performance concluding that, in this special case, dust conditioning is more important than gas conditioning.

32313 **Saving fuel oil with fuel-blending and emulsifying systems.** Bockwoldt, H.P. *CFI, Ceramic Forum International/Berichte der DKG;* **58**: No. 6, 463-465(Sep-Oct 1981). (In German, English).

A fuel-blending and emulsifying system can be of valuable assistance in improving the efficiency of the boiler and of the entire firing systen. This is of particular interest wherever fuel oil is used, because a 10:1 fuel oil/water emulsion not only saves a lot of fuel, but also offers numerous other advantages.

43 PARTICLE ACCELERATORS

32314 **(INIS-SU—67) Accelerators. Issue 17.** (Ministerstvo Vysshego i Srednego Spetsial'nogo Obrazovaniya SSSR, Moscow; Moskovskij Inzhenerno-Fizicheskij Inst. (USSR)). 1979. 121p. (In Russian). NTIS, PC A06/MF A01. Order Number DE82780241.

The papers included were entered in the data base separately. (WHK)

4301 Design, Development, And Operation

32315 (GSI—81-2, pp 236) **Unilac operation.** Angert, N.; Klabunde, J.; Mueller, M.; Strehl, P.; Wilms, D. Mar 1981. NTIS (US Sales Only), PC A16/MF A01.

In Scientific report 1980.

32316 (GSI—81-2, pp 249) **300 kV accelerator.** Wolf, B.H.; Vogt, D. Mar 1981. NTIS (US Sales Only), PC A16/MF A01.

In Scientific report 1980.

32317 (GSI—81-2, pp 250-252) **SIS - an accelerator facility for relativistic heavy ions.** Blasche, K.; Emmerling, M.; Franczak, B.; Franzke, B.; Kaspar, K.; Langenbeck, B.; Riedel, C. Mar 1981. NTIS (US Sales Only), PC A16/MF A01.

In Scientific report 1980.

32318 (GSI—81-2, pp 253) **Lattice of the booster synchrotron SIS40.** Franczak, B. Mar 1981. NTIS (US Sales Only), PC A16/MF A01.

In Scientific report 1980.

32319 (GSI—81-2, pp 264) **High current experiments in the Wideroee structure.** Klabunde, J.; Angert, N.; Keller, R.; Struckmeier, J.; Trautmann, H. Mar 1981. NTIS (US Sales Only), PC A16/MF A01.

In Scientific report 1980.

32320 (GSI—81-2, pp 265) **Proton model of a heavy-ion RFQ accelerator.** Deitinghoff, H.; Halfmann, K.; Junior, P.; Klein, H.; Langbein, K.; Mueller, J.; Neumann, W.; Schempp, A.; Mueller, R.W. Mar 1981. NTIS (US Sales Only), PC A16/MF A01.

In Scientific report 1980.

32321 (GSI—81-2, pp 266) **HOBILAC - a high-current accelerator system.** Krejcik, P. Mar 1981. NTIS (US Sales Only), PC A16/MF A01.

In Scientific report 1980.

4302 Beam Dynamics, Field Calculations, And Ion Optics

REFER ALSO TO CITATION(S) 32356

32322 (GSI—81-2, pp 248) **Plasma oscillations induced intensity modulations of the Unilac ion beam.** Mueller, M.; Schulte, H.; Wolf, B. Mar 1981. NTIS (US Sales Only), PC A16/MF A01.

In Scientific report 1980.

32323 (GSI—81-2, pp 260) **MIRKO - an interactive computer program for ion-optical systems.** Franczak, B.; Riedel, C. Mar 1981. NTIS (US Sales Only), PC A16/MF A01.

In Scientific report 1980.

32324 (GSI—81-2, pp 267) **Parmila-GSI - a computer program for beam dynamics in accelerators with space charge.** Holzschuh, G.; Klabunde, J.; Struckmeier, J.; Trautmann, H. Mar 1981. NTIS (US Sales Only), PC A16/MF A01.

In Scientific report 1980.

32325 **(LA-UR—81-3057) Mechanical design of RFQ resonator cavities in the 400-MHz frequency range.** Hansborough, L.D.; Potter, J.M.; Wilson, N.G. (Los Alamos National Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 4p. (CONF-811083—20). NTIS, PC A02/MF A01. Order Number DE82006126.

From 1981 linear accelerator conference; Santa Fe, NM, USA (19 Oct 1981).

Many RFQ resonator-cavity design concepts have been proposed in the 400-MHz frequency range. Los Alamos has been evaluating RFQ resonator-cavity designs that provide acceptable combinations of necessary mechanical features, easy tunability and long-term stability. Four RFQ resonator test cavities have been fabricated to test rf joints between the RFQ vanes and the resonator cavity. Two of these joints (the C-seal and the rf clamp-joint) allow vane movement for tuning. These test data, and the design of the present generation of RFQ resonator cavities, are presented.

32326 **(LA-UR—81-3058) Octupole focusing in transport and acceleration systems.** Crandall, K.R.; Pabst, M.; Stokes, R.H.; Wangler, T.P. (Los Alamos National Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 5p. (CONF-811083—17). NTIS, PC A02/MF A01. Order Number DE82006128.

From 1981 linear accelerator conference; Santa Fe, NM, USA (19 Oct 1981).

The radio-frequency quadrupole (RFQ) linac is capable of accelerating high-current, low-velocity ion beams. In accelerator systems comprising an RFQ and higher velocity accelerating structures, the current bottleneck still typically occurs within the RFQ. This limiting current is quite high in most cases, but linacs with even higher currents may be required in the future. We have begun a study of higher multipole systems to determine their capability for focusing and accelerating very high currents. We have chosen first to examine a radio-frequency octupole (RFO) transport system, and have developed a smooth-approximation analytical description that includes the conditions for input radial matching of a zero space-charge beam. Further, we have constructed a multiparticle beam-dynamics simulation program that accepts the low-current matched beam and gradually increases the beam current as it is transported. This results in a matched high-current beam, and the procedure can be used to determine the saturation-current limit of a periodic octupole system. As expected, at high currents the beam develops a hollow radial distribution that reduces the space-charge defocusing; initial results show that high currents can be transported. For acceleration, we have formulated the design parameters for a section of RFO linac, including the potential function, acceleration, and focusing efficiencies, and the geometry of the radially modulated pole tips.

4303 Auxiliaries And Components

REFER ALSO TO CITATION(S) 32228, 32358, 32370, 32422

32327 **(BNL—30337) Data acquisition and experiment control system for high-data-rate experiments at the National Synchrotron Light Source.** Alberi, J.L.; Stubblefield, F.W. (Brookhaven National Lab., Upton, NY (USA)). Nov 1981. Contract AC02-76CH00016. 9p. (CONF-811012—47). NTIS, PC A02/MF A01. Order Number DE82005236.

From IEEE symposium on nuclear science; San Francisco, CA, USA (21 Oct 1981).

A data acquisition and experiment control system for experiments at the Biology Small-Angle X-ray Scattering Station at the National Synchrotron Light Source has been developed based on a multiprocessor, functionally distributed architecture. The system controls an x-ray monochromator and spectrometer and acquires data from any one of three position-sensitive x-ray detectors. The average data rate from the position-sensitive detector is $\sim 10^6$ events/sec. Data is stored in a one megaword histogramming memory. The experiments at this Station require that x-ray diffraction patterns be correlated with timed stimuli at the sample. Therefore, depending on which detector is in use, up to 10^3 time-correlated diffraction patterns may be held in the system memory simultaneously. The operation of the system is functionally distributed over four processors communicating via a multiport memory.

32328 **(GKSS—80/E/33) Computer aided extractor design for the RIG 10 high intensity ion source.** Tanzer, F.; Haeuser, J.; Eppel, D. (GKSS-Forschungszentrum Geesthacht G.m.b.H., Geesthacht-Tesperhude (Germany, F.R.). Inst. fuer Physik). 1980. 17p. (CONF-8005128—2). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82780281.

From International conference on plasma science; Madison, WI, USA (19 May 1980).

The paper discusses recent progress of the rf-ion source RIG 10, and describes a computer code for the simulation of the ion trajectories. The RIG 10 is designed for current densities of some 300 mA/cm^2, and will be used for the production of neutral.

32329 (GSI—81-2, pp 259) **UHV-test-section for SIS.** Bourgeois, W.; Finke, P.; Franzke, B.; Kritzer, A. Mar 1981. NTIS (US Sales Only), PC A16/MF A01.
In Scientific report 1980.

32330 (GSI—81-2, pp 243) **Parasitic oscillations and their suppression in the Alvarez final radio-frequency amplifiers.** Hutter, G. Mar 1981. NTIS (US Sales Only), PC A16/MF A01.
In Scientific report 1980.

32331 (GSI—81-2, pp 244) **New capacitive tuners for the single-gap-cavities.** Emmerling, M. Mar 1981. NTIS (US Sales Only), PC A16/MF A01.
In Scientific report 1980.

32332 (GSI—81-2, pp 255) **Prototype thyristor-controlled power supply.** Breitenberger, G. Mar 1981. NTIS (US Sales Only), PC A16/MF A01.
In Scientific report 1980.

32333 (GSI—81-2, pp 256) **Measurements on the ferrite rings for the SIS prototype-cavity.** Kaspar, K.; Emmerling, M.; Gasper, A. Mar 1981. NTIS (US Sales Only), PC A16/MF A01.
In Scientific report 1980.

32334 (GSI—81-2, pp 228) **Process control of the UNILAC.** Wiemers, M.; Bock, F.; Ehrlich, A.; Ertan, F.; Grasmueck, B.; Morrison, I.; Rochna, D.; Schaffner, E.; Wambach, U. Mar 1981. NTIS (US Sales Only), PC A16/MF A01.
In Scientific report 1980.

32335 (GSI—81-2, pp 229-232) **Engineering and technology.** Malwitz, E.; Blasche, K.; Bleuel, W.; Gaiser, H.; Groesch, H.; Illert, K.; Kaiser, R.; Kiesewetter, H.; Kopf, U.; Kraus, H. Mar 1981. NTIS (US Sales Only), PC A16/MF A01.
In Scientific report 1980.
The engineering activities at the UNILAC are described. Especially considered is the development concerning cavity resonators and the rf-system. Furthermore, the beam monitor and the crystal ball detector system are briefly described.

32336 (GSI—81-2, pp 237) **New emittance measuring device of the Unilac.** Strehl, P.; Englert, G.; Hartung, M.; Horneff, H. Mar 1981. NTIS (US Sales Only), PC A16/MF A01.
In Scientific report 1980.

32337 (GSI—81-2, pp 238) **Fast measurement of charge state distributions behind the stripper.** Fradj, M.; Christmann, R.; Strehl, P. Mar 1981. NTIS (US Sales Only), PC A16/MF A01.
In Scientific report 1980.

32338 (GSI—81-2, pp 239) **On-line transverse beam matching at the Unilac.** Dahl, L.; Zeidler, A. Mar 1981. NTIS (US Sales Only), PC A16/MF A01.
In Scientific report 1980.

32339 (GSI—81-2, pp 240) **Method for computer aided alignment of the Unilac beam.** Dahl, L.; Schaa, V. Mar 1981. NTIS (US Sales Only), PC A16/MF A01.
In Scientific report 1980.

32340 (GSI—81-2, pp 241) **μP-control of rf-systems at the Unilac.** Wilms, D.; Christmann, R.; Dehnhardt, W.; Fradj, M.; Strehl, P. Mar 1981. NTIS (US Sales Only), PC A16/MF A01.
In Scientific report 1980.

32341 (GSI—81-2, pp 254) **Preparatory work for the SIS magnet measuring equipment.** Breitenberger, G.; Langenbeck, B.; Moritz, G.; Steiner, R. Mar 1981. NTIS (US Sales Only), PC A16/MF A01.
In Scientific report 1980.

32342 (GSI—81-2, pp 257) **On-line control of ferrite measurements performed by a desktop computer.** Kaspar, K.; Ahrens, J. Mar 1981. NTIS (US Sales Only), PC A16/MF A01.
In Scientific report 1980.

32343 (GSI—81-2, pp 258) **Amplitude, frequency and phase control for the SIS accelerating cavities.** Emmerling, M.; Kaspar, K. Mar 1981. NTIS (US Sales Only), PC A16/MF A01.
In Scientific report 1980.

32344 (GSI—81-2, pp 247) **Ion source development - ECR test source.** Schulte, H. Mar 1981. NTIS (US Sales Only), PC A16/MF A01.
In Scientific report 1980.

32345 (GSI—81-2, pp 263) **High current ion sources development.** Keller, R. Mar 1981. NTIS (US Sales Only), PC A16/MF A01.
In Scientific report 1980.

32346 (GSI—81-2, pp 184) **Production of thin targets of high isotopic enrichment with an electromagnetic separator.** Meunier, R.; Daban-Haurou, J.L.; Salome, M.; Nickel, F. Mar 1981. NTIS (US Sales Only), PC A16/MF A01.
In Scientific report 1980.

32347 (GSI—81-2, pp 186) **Preparation of ^{248}Cm sources for experiments with heavy ions.** Trautmann, N.; Heimann, R.; Gembalies-Datz, D.; Kaffrell, A.K. Mar 1981. NTIS (US Sales Only), PC A16/MF A01.
In Scientific report 1980.

32348 (GSI—81-2, pp 187) **Tests of curium metal targets for the synthesis of superheavy elements.** Lougheed, R.W.; Hulet, E.K.; Landingham, R.L.; Nitschke, J.M.; Folger, H.; Kratz, J.V.; Bruechle, W.; Gaeggeler, H.; Maor, I. Mar 1981. NTIS (US Sales Only), PC A16/MF A01.
In Scientific report 1980.

32349 (GSI—81-2, pp 194) **Window- and target-system for damped heavy-ion reactions at the gasjet with intense heavy-ion beams.** Dersch, G.; Hirdes, D.; Brandt, R.; Lemmertz, P.; Wollnik, H. Mar 1981. NTIS (US Sales Only), PC A16/MF A01.
In Scientific report 1980.

32350 (GSI—81-2, pp 245) **Pulsed magnetic beam shifter for an emittance measurement equipment.** Langenbeck, B.; Moritz, G.; Zweig, K. Mar 1981. NTIS (US Sales Only), PC A16/MF A01.
In Scientific report 1980.

32351 (GSI—81-2, pp 270) **Wrapping screw: An alternative to synchrotron type storage rings for HIF.** Mueller, R.W. Mar 1981. NTIS (US Sales Only), PC A16/MF A01.
In Scientific report 1980.

32352 **(KEK—79-34) Proceedings of the plan meetings on x-ray instrumentation for the photon factory, Tsukuba, March to September, 1979.** Ando, M.; Amemiya, Y. (eds.). (National Lab. for High Energy Physics, Oho, Ibaraki (Japan)). Mar 1980. 318p. (In Japanese). (CONF-7903162—). NTIS (US Sales Only), PC A14/MF A01. Order Number DE82780219.

From Meeting on x-ray detectors; Oho, Ibaraki, Japan (22 Mar 1979).

Individual items from the meeting were prepared separately for the data base. (GHT)

32353 **(KFTI—80-45) Ion acceleration in heavy-current electron beam injected in neutral gas.** Lymar, A.G.; Pristupa, V.I.; Khizhnyak, N.A. (AN Ukrainskoj SSR, Kharkov. Fiziko-Tekhnicheskij Inst.). 1980. 9p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700353.

First results of investigations on ion acceleration in the non-relativistic electron beam (100 eV, 0.1 A), injected in neutral gas are presented. It is shown that the specific features of the acceleration process are approximately the same as in the case of injection of relativistic electron beams (REB). An efficient reproducibility of the acceleration process, easiness of the parameter changing and the process diagnostics make possible obtaining a more detailed information than that gained by the present time using REB. The conclusion is drawn on the base of the results obtained that the ion acceleration models in which acceleration is a sequence of change of ion quantity in time do not correspond to the real process as the time of ion acceleration cycle in reality turns to be much less as compared with the time during which the ion quantity visibly is changed in the system.

32354 **(LBL-PUB—426) User facilities at the Lawrence Berkeley Laboratory.** (Lawrence Livermore National Lab., CA (USA)). 1982. Contract W-7405-ENG-48. 9p. NTIS, PC A02/MF A01. Order Number DE82004953.

Much of the research facilities and equipment at LBL have long been available to qualified outside users. Of these, the facilities used by outside researchers are of two types: (1) those that have a formal, designated status as a national research facility (the Bevalac, the SuperHILAC, and the National Center for Electron Microscopy); and (2) those that lack such formal status and user procedures, but which are used to a significant degree by non-LBL scientists and engineers.

32355 **(RL—81-061) Data acquisition tasks for TASSO. User manual.** Quarrie, D.R. (Science Research Council, Chilton (UK). Rutherford and Appleton Labs.). Jul 1981. 42p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE82700358.

The TASSO Data Acquisition System is designed to accept events from various trigger sources at rates of several Hz and to transfer these events to the central DESY IBM Triplex for later offline analysis. A NORD 10S computer is used for this purpose with several data acquisition tasks running under control of a Supervisor task DASSO that is described elsewhere.

32356 (SLAC—245, pp 313-353) **Linear colliders: a preview.** Wiedemann, H. (Stanford Linear Accelerator Center, CA). Jan 1982. NTIS, PC A99/MF A01.

From Summer institute on particle physics; Stanford, CA, USA (27 Jul 1981).

In order to make the linear collider principle feasible at very high energies a number of problems have to be solved. There are two kinds of problems: one is related to the feasibility of the principle, and the other is associated with minimizing the cost of constructing and operating such a facility. These problems and possible solutions are discussed. Since the real test of a principle requires the construction of a prototype, the last chapter describes the SLC project at the Stanford Linear Accelerator Center.

32357 (SLAC—245, pp 355-380) **Recent results from the crystal ball.** Porter, F.C. (California Inst. of Technology, Pasadena). Jan 1982. NTIS, PC A99/MF A01.

From Summer institute on particle physics; Stanford, CA, USA (27 Jul 1981).

During the past year, the Crystal Ball experiment has continued the investigation of e^+e^- interactions at SPEAR. In the course of the year, we have slightly more than doubled the available datasets at the J/psi (to 2.2 x 10^6 produced J/psi) and the psi' (to 1.8 x 10^6 produced psi') resonances, and have increased the data in the 5.2 to 7.4 GeV center-of-mass (E/sub c.m./) region. The present discussion is limited to recent results obtained with the J/psi and psi' datasets, primarily dealing with transitions among the charmonium bound states.

4304 Storage Rings

REFER ALSO TO CITATION(S) 32893

32358 **(DOE/ER/40039—1) High-energy-physics program at Texas A and M University. Annual progress report, July 15-December 1, 1981.** McIntyre, P.M.; Webb, R.C. (Texas A and M Univ., College Station (USA). Dept. of Physics). 1981. Contract AS05-81ER40039. 19p. NTIS, PC A02/MF A01. Order Number DE82006798.

Progress on development of the forward spectrometer for the Collider Detector Facility at Fermilab's anti p p collider is described. Design and construction of the hadron calorimeter system, development of the microchannel plate intensifier for the Chernkov counter, and developments in software support are briefly discussed. (WHK)

32359 (GSI—81-2, pp 262) **Accelerator studies for heavy-ion fusion.** Mueller, R.W.; Beckert, K. Mar 1981. NTIS (US Sales Only), PC A16/MF A01.

In Scientific report 1980.

32360 (GSI—81-2, pp 268) **Beam losses in the storage ring due to charge changing collisions within a beam of Cs^+-ions.** Beckert, K. Mar 1981. NTIS (US Sales Only), PC A16/MF A01.

In Scientific report 1980.

32361 (GSI—81-2, pp 269) **Storage ring problems in the HIBALL-scenario.** Beckert, K.; Mueller, R.W. Mar 1981. NTIS (US Sales Only), PC A16/MF A01.

In Scientific report 1980.

32362 (GSI—81-2, pp 271) **Efficiency of a heavy-ion fusion accelerator facility.** Boehne, D. Mar 1981. NTIS (US Sales Only), PC A16/MF A01.

In Scientific report 1980.

32363 (SLAC—245, pp 261-312) **Design constraints and limitations in e^+e^- storage rings.** le Duff, J. Jan 1982. NTIS, PC A99/MF A01.

From Summer institute on particle physics; Stanford, CA, USA (27 Jul 1981).

In this four part report, single particle dynamics, design constraints, behavior of existing storage rings, and the future of e^+e^- storage rings are discussed. (GHT)

32364 (SLAC—245, pp 403-426) **Recent results from CLEO.** Gilchriese, M.G.D. (Cornell Univ., Ithaca, NY). Jan 1982. NTIS, PC A99/MF A01.

From Summer institute on particle physics; Stanford, CA, USA (27 Jul 1981).

The CLEO detector has been operating at the Cornell Electron Storage Ring (CESR) since September 1979. Charged particle tracking is provided by a 17 layer drift chamber and a 3 layer proportional chamber within a 1 m radius, 4KG solenoidal magnet. Hadron identification consists of 96 time-of-flight counters covering about one-half of 4π and, presently, four pressurized dE/dx modules which measure specific ionization. Lead proportional tube shower counters surround the time of flight counters and enclose the central detectors with two endcaps. Muons are identified by penetration through iron and detected in a two-dimensional array of planar drift chambers. Substantial modifications are being made to the CLEO detector this summer. The compensating solenoids which cancel out the field from the spectrometer magnet will be removed to allow the interaction quadrupoles to be placed closer to the interaction point. This should yield a factor of 2 to 3 in increased luminosity. A 10 KG superconducting solenoid will replace the conventional aluminum coil and provide 2.5 times better momentum resolution and reduced operating costs. The Cerenkov

counters in the outer detector will be replaced by dE/dx modules identical to the four currently in place. This will increase the hadron identification capabilities. An improved calibration system for the time of flight counters is planned. Improvements to the electronics and trigger system, consisting of smarter crate controllers and precision track processors will also be installed. CESR and CLEO will be back on the air by October.

32365 (SLAC—245, pp 536-567) **Recent e^+e^- results from PETRA.** Wu, S.L. (Univ. of Wisconsin, Madison). Jan 1982. NTIS, PC A99/MF A01.

From Summer institute on particle physics; Stanford, CA, USA (27 Jul 1981).

Recent experimental data are reviewed from the five detectors at PETRA: CELLO, JADE, MARK J, PLUTO, and TASSO. The many interesting new results include, for example, the copious production of baryons, especially Λ and anti Λ, and the observation of forward-backward asymmetry for $e^+e^- \rightarrow \mu^+\mu^-$ due to weak and electromagnetic interference. Some future plans at PETRA are also discussed.

32366 (SLAC—245, pp 569-601) **Early results from the MKII detector at PEP.** Dorfan, J. (Stanford Linear Accelerator Center, CA). Jan 1982. NTIS, PC A99/MF A01.

From Summer institute on particle physics; Stanford, CA, USA (27 Jul 1981).

Preliminary PEP results from the MKII detector are presented based on an integrated luminosity of 15.4 pb^{-1}. All data are at the center-of-mass energy (E/sub c.m./) of 29 GeV. General characteristics of the one-photon annihilation data include (among other things) measurements of R, (n)/sub charged/, inclusive momentum distributions for hadrons and K^0's and evidence for broad (high sphericity) planar events. These results are qualitatively in good agreement with those of the PETRA experiments. Comparisons between inclusive momentum distributions from MKII data taken at SPEAR (E/sub c.m./ = 5.2 GeV) and PEP (E/sub c.m./ = 29 GeV) imply sizeable scaling violations in x (= 2P/E/sub c.m./). Diparticle energy correlations have been studied yielding fully corrected model independent measurements for comparison with QCD models. A comparison with one such first order calculation yields a result for the strong coupling constant, α/sub s/. A cluster algorithm has been used to study multijet topologies and in particular the three-jet topology yields a measurement of the gluon spin and a test of gluon fragmentation. The first positive measurement of the γ lifetime is presented which agrees with the expectation from e-μ-tau universality of the weak charged current. From e-μ events upper limits are placed on the mass of a new heavy lepton as well as a spin-0 boson. Using the reaction $e^+e^- \rightarrow \gamma\gamma$ stringent tests of QED scale breaking are presented. Effects of Z^0 exchange are studied using the reactions $e^+e^- \rightarrow e^+e^-$ and $e^+e^- \rightarrow \mu^+\mu^-$ which yield measurements of the weak coupling constants g/sub A/² and g/sub V/².

44 INSTRUMENTATION

4401 Radiation Instrumentation

REFER ALSO TO CITATION(S) 32001, 32003, 32200, 32357, 32364, 32366, 32571, 32686, 32822

32367 (AECP—8(Pt.2)) **Design principles for radiological protection instrumentation systems.** Wells, F.H.; Powell, R.G. (UKAEA Atomic Energy Research Establishment, Harwell. Instrumentation and Applied Physics Div.). Feb 1981. 118p. NTIS (US Sales Only), PC A06/MF A01. Order Number DE82700407.

This Code of Practice takes the form of recommendations intended for designers and installers of Radiological Protection Instrumentation, and should also be of value to the newcomer to the R.P.I. field. Topics are discussed under the following headings: outline of R.P.I. requirements, specifying the requirement, satisfying the requirements, (overall design, availability and reliability, information display, human factors, power supplies, manufacture, quality assurance, testing, and cost analysis), supply, location and operation of the equipment, importance of documentation.

32368 (AERE-R—10206) **Moessbauer spectrometer for difficult isotopes.** Cranshaw, T.E. (UKAEA Atomic Energy Research Establishment, Harwell. Nuclear Physics Div.). Jun 1981. 11p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700191.

The parameters of some Moessbauer isotopes present experimental difficulties either because high velocities, low frequencies, low temperatures, or any combination of these conditions, are needed. A simple approach to easing these difficulties is described, using a mechanical resonant system and a phase locked loop.

32369 (DOE/ER/40033—13) **Development and performance of a high pressure hydrogen time projection chamber.** Chapin, T.J.; Cool, R.L.; Goulianos, K.; Silverman, J.P.; Snow, G.R.; Sticker, H.; White, S.N.; Chou, Y.H. (Rockefeller Univ., New York (USA); Academia Sinica, Beijing (China). Inst. of High Energy Physics). Oct 1981. Contract AC02-81ER40033. 5p. NTIS, PC A02/MF A01. Order Number DE82005518.

We describe a high pressure hydrogen gas time projection chamber (TPC) which is presently operating at Fermilab both as target and as recoil detector in an experiment investigating the diffraction dissociation of photons on hydrogen, $\gamma p \rightarrow Xp$. The TPC, which consists of two cylindrical drift regions each 45 cm in diameter and 75 cm long, measures the polar angle and the energy loss dE/dx of the recoil protons. Typically, at 15 atm of H_2 with 2 kV/cm drift field and 7 kV on the 35 μ sense wires, the drift velocity is about 0.5 cm/μ sec and the spatial resolution +- 200 μ.

32370 (EFI—398(5)-80) **Program controlled system for measuring and monitoring the electron coherent radiation spectrum of Yerevan synchrotron.** Adamyan, F.V.; Vartapetyan, G.A.; Galumyan, P.I. (Erevanskij Fizicheskij Inst. (USSR)). 1980. 16p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700408.

An automatic system for measurement, processing and control of energy spectrum of polarized photons realized at the Yerevan electron synchrotron is described. For measuring energy spectra of intensive high energy photon beams a pair spectrometer is used which comprises an aluminium target-converter, an analizing magnet and 2 telescopes of scintillation counters for electron-positron pairs registration. the procedure of spectra measurement by the pair spectrometer is reduced to determining the converted e^+e^- pairs yield at certain values of the H field intensity of the analizing magnet. An algorithm of the data express-processing for operative monitoring of peak energy stability of electron coherent radiation spectrum is given. The spectra measurement results obtained under real experimental conditions are presented.

32371 (EFI—401(8)-80) **Simulation of neutron detection process in modular detectors.** Arustamyan, G.V.; Vartapetyan, G.A.; Galumyan, P.I.; Grabskii, V.O. (Erevanskij Fizicheskij Inst. (USSR)). 1980. 18p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700462.

An algorithm is developed on which basis the NETRON program is written for simulation of the neutron detection process in plastic scintillation module structure detectors in the 1-300 MeV energy range. The NETRON program written in FORTRAN allows calculating module detector efficiency determining coordinate and angular detector resolution as well as determining the probability of effects connected with neutron detection in two or more modules simultaneously. The module detector characteristics calculated by means of the program are compared with experimental data.

32372 (FEI—1099) **Experimental study of specific fluorescence features of organic scintillators during their interactions with fast neutrons and gamma-quanta.** Trykov, O.A.; Vladimirov, V.V. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Obninsk. Fiziko-Ehnergeticheskij Inst.). 1980. 12p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700409.

Peculiarities of a fast component of organic scintillator luminescence when registering gamma quanta and fast neutrons have been experimentally investigated. An experimental method for conducting the investigations is described. In which by means of the Brooks integrated circuit the changes in the charge values on the photomultiplier anode were tracked both depending on the energy of registered particles and on the RaCa parameter value where Ra - the anode resistance, Ca -the the anode capacity. The investigations were carried on on a stilbene crystal excited with 0.02-5 MeV Compton electrons and 0.2-10 MeV recoil protons.

32373 **(FEI—1112) Absolute efficiency of the cylindrical neutron He^3-counter cassette.** Liforov, V.G.; Mironova, T.M.; Novikov, A.G.; Parfenov, V.A. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Obninsk. Fiziko-Ehnergeticheskij Inst.). 1980. 39p. (In Russian). NTIS (US Sales Only), PC A03/MF A01. Order Number DE82700410.

A method for determining absolute efficiency of an assembly consisting of cylindrical neutron He^3 counters in the neutron energy range of 0.005-1.0 eV is described. An experimental-calculational method was used when determining the efficiency. Main efficiency component ("direct" neutron contribution) was measured experimentally. Effect of neutron scattering in counter walls on the efficiency was estimated by a calculationce method. The Monte-Carlo method was used to calculate the assembly efficiency for this purpose. BESM-6 computer program for the counter efficiency calculation is described. Results of calculations according to the program for SNM-33 counters used in the PIN-1M spectrometer detector system are given. It is established on the base of the calculations that contribution of scattering to the efficiency for the SNM-33 counters amounts to 2-10% in the energy range from 0.005 to 10 eV. The total absolute efficiency of the assembly consisted of three counters at 300 meV neutron energy equals 0.5 at that complete error of the efficiency determination is 2%.

32374 **(GKSS—80/E/36) Interlaboratory niobium dosimetry comparison. The contribution of the GKSS-Forschungszentrum Geesthacht.** Wille, P. (GKSS-Forschungszentrum Geesthacht G.m.b.H., Geesthacht-Tesperhude (Germany, F.R.). Inst. fuer Physik). 1980. 19p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82780282.

For an interlaboratory comparison of neutron dosimetry using niobium the ^{93}sup(m)Nb activities of irradiated niobium monitors were measured. This work was performed to compare the applied techniques of dosimetry with Nb in different laboratories. The niobium monitors were irradiated in the fast breeder EBRII, USA and the BR2, Belgium. The monitors were dissolved and several samples were prepared. Their niobium contents were determined by the ^{94}Nb-count rates. since the original specific count rate was known. The KX radiations of the ^{93}sup(m)Nb of the samples and of a calibrated Nb-foil were compared. This foil was measured by PTB, Braunschweig and CBNM, Geel, which we additionally compared with the KX radiation of ^{88}Sr produced by a thin ^{88}Y source from a ^{88}Y-standard solution (PTB).

32375 (GSI—81-2, pp 212) **Computerized electronics for nuclear research.** Walter, P. v.; Farr, W.; Glaessel, P.; Harrach, D. v.; Maenner, R.; Specht, H.J. Mar 1981. NTIS (US Sales Only), PC A16/MF A01.
In Scientific report 1980.

32376 (GSI—81-2, pp 213) **Simplified constant fraction discriminator circuit for application in multichannel discriminators.** Maier, M.R. Mar 1981. NTIS (US Sales Only), PC A16/MF A01.
In Scientific report 1980.

32377 (GSI—81-2, pp 214) **Improvements to the multi on-line analysis system.** Weik, F. Mar 1981. NTIS (US Sales Only), PC A16/MF A01.
In Scientific report 1980.

32378 (GSI—81-2, pp 215) **Experimental electronics group (Elektronik/Experimente).** Albrecht, R.; Dengler, J.; Dusek, J.; Hammal, H.; Hardel, H.; Liebold, H.P.; Moemerzheim, K.; Poppensieker, K.; Quis, D.; Richter, M. Mar 1981. NTIS (US Sales Only), PC A16/MF A01.
In Scientific report 1980.

32379 (GSI—81-2, pp 205) **Particle detector for multiparameter coincidence measurements in atomic physics.** Schadt, W.; Bethge, K.; Schmidt-Buecking, H.; Stiebing, K.E. Mar 1981. NTIS (US Sales Only), PC A16/MF A01.
In Scientific report 1980.

32380 (GSI—81-2, pp 206) **Application of a position sensitive proportional counter for an X-ray transmission spectrometer.** Schartner, K.H.; Flaig, H.J.; Scharmann, A.; Beyer, H.F.; Mokler, P.H. Mar 1981. NTIS (US Sales Only), PC A16/MF A01.
In Scientific report 1980.

32381 (GSI—81-2, pp 179) **Correcting overlapping counts in dose calibrations at high event density.** Riedel, C.; Spohr, R. Mar 1981. NTIS (US Sales Only), PC A16/MF A01.
In Scientific report 1980.

32382 (GSI—81-2, pp 190) **Status of the NaI crystal ball project.** Graef, H.; Haeusser, O.; Jaeschke, E.; Metag, V.; Repnow, R.; Habs, D.; Hemolt, U. v.; Heyng, H.W.; Kolb, B.; Krieger, H. Mar 1981. NTIS (US Sales Only), PC A16/MF A01.
In Scientific report 1980.

32383 (GSI—81-2, pp 192) **Plastic wall scintillator detector array.** Baden, A.; Gutbrod, H.H.; Maier, M.; Peter, J.; Ritter, H.G.; Stelzer, H.; Warwick, A.I.; Weik, F.; Wieman, H. Mar 1981. NTIS (US Sales Only), PC A16/MF A01.
In Scientific report 1980.

32384 (GSI—81-2, pp 195) **Tori spectrometer, a new instrument for positron- and electronspectroscopy.** Kankeleit, E.; Koehler, R.; Kollatz, M.; Krieg, R.; Senger, P.; Backe, H. Mar 1981. NTIS (US Sales Only), PC A16/MF A01.
In Scientific report 1980.

32385 (GSI—81-2, pp 198) **In-beam laser fluorescence spectroscopy.** Huber, G.; Klepper, O.; Kuehl, T.; Marx, D.; Seckert, U.; Ulm, G.; Fass, R. Mar 1981. NTIS (US Sales Only), PC A16/MF A01.
In Scientific report 1980.

32386 (GSI—81-2, pp 199) **Heavy ion microprobe - a status report.** Fischer, B.E.; Krejcik, P. Mar 1981. NTIS (US Sales Only), PC A16/MF A01.
In Scientific report 1980.

32387 (GSI—81-2, pp 200) **Detector development for the 5 m time-of-flight spectrometer.** Arlt, U.; Bass, R.; Noll, H.; Odenweller, T.; Renfordt, R.; Sapotta, K. Mar 1981. NTIS (US Sales Only), PC A16/MF A01.
In Scientific report 1980.

32388 (GSI—81-2, pp 201) **Development and calibration of NE 213 neutron detectors with pulse shape discrimination.** Arlt, U.; Dittmar, H.; Koerfer, M.; Kreyling, G.; Merten, R.; Mueller, W.; Piroth, J.; Stelzer, K. Mar 1981. NTIS (US Sales Only), PC A16/MF A01.
In Scientific report 1980.

32389 (IAE—3281/2) Possibility of application of crystals scintillators on the basis of ammonium iodides and other analogous compounds as fast neutron detectors. Dobrynin, Yu.L.; Protopopov, Kh.V. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Atomnoj Ehnergii). 1980. 35p. (In Russian). NTIS (US Sales Only), PC A03/MF A01. Order Number DE82700411.

It is suggested to use as scintillators for neutron detectors luminescent crystals on the basis of ammonium iodides and its tetraalkilsubstituted and double salts of these compounds with europium and gadolinium halides. By the Monte Carlo method time dependences of detecting efficiencies of ^{252}Cf fission neutrons and reactor antineutrinos are calculated by means of large detectors on above crystals. It is shown theoretically that new crystals should considerably surpass as for neutron quick capture ability liquid and plastic scintilators containing gadolinium Scintillation properties of the NH_4J-Tl crystal are experimentally investigated. Specific features of the scintillation process in this crystal are considered.

32390 (IAEA-R—2051-F) Investigation of the radiochromic dye film dosimeter under process conditions, including stability, precision, accuracy, the influence of dose rate, and the influence of the environment. Part of a coordinated programme on high-dose standardization and intercomparison for industrial radiation processing. Final report for the period 1 August 1977 - 31 July 1981. Miller, A. (International Atomic Energy Agency, Vienna (Austria)). Aug 1981. 16p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE81701011.

In the course of the work irradiations have been performed with both cobalt-60 gamma and electron accelerators. Readout of radiation induced optical densities has been made on various spectrophotometers. Irradiations have been performed under changing conditions of temperature, relative humidity and dose rate, investigating various types of the polyvinyl butyral dosimeters with respect to their sensitivity, stability and optical and mechanical properties. A new formulation of the solution from which dosimeters are cast has been developed. The dosimeter has been found to be rather independent of changes in absorbed dose rate. Maximum deviations are 15% in the range of 0.2 Gy/sec to 10^{12} Gy/sec. It has been shown that a short heat treatment after irradiation stabilizes the response and enhances it slightly. The plastic film dosimeter consisting of a radiochromic dye precursor (hexa(hydroxyethyl) pararosaniline cyanide) dissolved in a plastic matrix has been investigated and further developed. The dosimeter has been shown to be highly unable for industrial purposes, but suffers still from drawbacks, namely sensitivity to UV light and the need of frequent recalibrations, factors, however, which future work may be able to eliminate.

32391 (IFUSP-P—250) Modified version of the Monte Carlo computer code for calculating neutron detection efficiencies. Nakayama, K.; Pessoa, E.F.; Douglas, R.A. (Sao Paulo Univ. (Brazil). Inst. de Fisica). Dec 1980. 28p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE82700201.

A calculation of neutron detection efficiencies has been performed for organic scintillators using the Monte Carlo Method. Effects which contribute to the detection efficiency have been incorporated in the calculations as thoroughly as possible. The reliability of the results is verified by comparison with the efficiency measurements available in the literature for neutrons in the energy range between 1 and 170 MeV with neutron detection thresholds between O.1 and 22.3 MeV.

32392 (IFVE-OEF—80-141) GAMS-200 hodoscope gamma spectrometer. Binon, F.; Brikman, K.; Guanehr, M. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov. Inst. Fiziki Vysokikh Ehnergij). 1980. 23p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700412.

A GAMS-200 hodoscopic gamma-spectrometer intended for precision measurements of differential cross sections of charge-exchange $\pi^- p$ scattering is described. The spectrometer is assembled of 208 counters of total absorption, which radiators are made of transparent lead glass. To improve light yield and isolation from each other the radiators are covered with aluminized mailar. The optimum transverse cell dimensions is 42 cm. The Cherenkov radiation induced by particles passed through the counter are recorded by the PEM-84 photomultiplier with the 24 mm diameter. The pulses from the spectrometer counters through 60 ns gate, and then digital data are read in a NP 2100 A computer. All the spectrometer counters are continuously monitored using pulse light diodes. It is established that for 12 days of operation under the experimental conditions the drift of 208 counters of the spectrometer is +- 2%. Spectrometer calibration is performed in two stages: firstly using a muon beam, and then - an electron beam. The spectrometer performances are investigated in electron beams of different energies from 1.8 to 40 GeV.

32393 (IFVE-OEF—81-45) Evaluation of shower parameters by the moments method in hodoscope calorimeters. Bityukov, S.I.; Sadovskii, S.A.; Semenov, V.K.; Smirnova, V.V. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov. Inst. Fiziki Vysokikh Ehnergij). 1981. 23p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700413.

The paper uses the moments method to evaluate the coordinates and energies of each of two electromagnetic showers in their space overlapping in hodoscope calorimeters. One-dimensional case has been considered in detail as well as the solution for a two-dimensional case inherent in cell-type hodoscope calorimeters is presented. Space and energy resolutions for the proposed method have been analyzed. An analytic dependence, describing the available experimental data, of hodoscope calorimeter space resolution on the hodoscope element size has been obtained. Considerations for shift of sample values of high-order group moments have also been treated. Realization of the found solution does not require much computer time and severe constraints on uniformity of hodoscope elements in calorimeters. Presented method may be applied for evaluation of parameters of overlapping spectra or similar form signals.

32394 (IFVE-OEF—81-63) High resolution Cherenkov counter with liquid radiator. Solyanik, V.I. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov. Inst. Fiziki Vysokikh Ehnergij). 1981. 15p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700414.

The Cherenkov counter with a liquid radiator and radiator dispersion compensation has been developed and experimentally studied. It has weak velocity resolution dependence on the beam geometrical dimensions. The counter is intended for detection of particles with $\beta = 1\text{-}0.85$ in the beam with transverse dimensions of 100 mm with the slope angles of particle trajectories to the beam axis of <10 mrad and has the resolution $\Delta sub(\beta/\beta) = 10sup(-3)\text{-}10sup(-4)$ depending on the angular spread of particle trajectories.

32395 (IFVE-OEIPK—80-143) European hybrid spectrometer. Part D: hadron calorimeters. Aguilar-Benitez, M.; Voltolini, Ch.; Dyuran, I. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov. Inst. Fiziki Vysokikh Ehnergij). 1980. 20p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700415.

For total detecting of neutral hadrons produced in strong interactions and flying into a front hemisphere it is proposed to equip the European hybrid spectrometer with two calorimeters. A general description of the calorimeters is given, as well as the study of the calorimeter construction is presented from the point of view of the solved physical problems. The front hadron calorimeter has a cellular structure. Each cell of the calorimeter has 16 blocks consisting of an iron plate of the 5 cm thickness and a plastic scintillator of the 2 cm thickness. The total number of such cells in the front hadron calorimeter is 200. The cell length is 1.25 m, the total absorber weight is 28 tons, the total scintillator weight is 1.6 tons. Light gathering in the front hadron calorimeter is performed using a cylindrical re-emitter passed through the scintillator plates. The area overlapped by calorimeter is 3x1.5 m. The schematic structure of the intermediate hadron calorimeter of the 1.7x2 m dimensions with the 1.0x0.4 m central opening is described as well. The inter-

mediate calorimeter contains 12 iron plates of the 5 cm thickness. 12 scintillation strips, each of the 2 cm thickness, are located between every two iron plates. Light from four series strips will be gathered by one photomultiplier. The total intermediate calorimeter length is 97 cm, and its weight is 16 tons. The intermediate calorimeter provides neutron recording with the approximately 95% efficiency.

32396 **(IFVE-ONF—81-24) Optimization of drift chamber parameters with wide drift gaps using $Ar+CO_2$ working mixture.** Bozhko, N.I.; Borisov, A.A.; Vovenko, A.S.; Kozhin, A.S.; Tumakov, V.L.; Fakhrutdinov, R.M.; Filippov, G.N. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov. Inst. Fiziki Vysokikh Ehnergij). 1981. 15p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700416.

The dependence of the electron drift velocity in the $Ar+CO_2$ working mixture on the E electric field intensity and CO_2 concentration is investigated. An experimental plant for measuring electron drift velocity in a gas mixture, which represents a combination of a wide drift gap (220 mm) and a proportional counter of rectangular cross section is described. The proportional counter is separated from the drift gap by a grid which gives the possibility to fix accurately in the drift gap the zero potential level. There are 9 pairs of 30x1 mm^2 holes in the chamber vessel which serve as collimators for Sr^{90}-beta source. The drift velocity has been measured by the drift time difference for two β-source fixed positions. The drift velocity measuring accuracy is 0.3-1.0%. The electron drift velocity measurements in the $Ar+CO_2$ mixture depending on the electric field intensity have been performed at CO_2 concentration from 2 to 20% in the E/p interval from 0.2 to 3.6 kV/cm. atm., where P is pressure in chamber. On the basis of measuring results presented the conclusion is drawn that the electron drift velocity saturation in the $Ar+Co_2$ mixture is observed at the CO_2 approximately 15% concentration and E/p value in the 1.1-2.5 kV/cm. atm. intorval. For the chamber with 250 mm drift gap optimization of its parameters for providing drift velocity maximum stability is performed.

32397 **(INIS-mf—6833) Focal plane camera for celestial XUV sources.** Huizenga, H. (Amsterdam Univ. (Netherlands)). 3 Dec 1980. 142p. NTIS (US Sales Only), PC A07/MF A01. Order Number DE82780204.

Thesis.

This thesis describes the development and performance of a new type of X-ray camera for the 2-250°A wavelength range (XUV). The camera features high position resolution (FWHM approximately 0.2 mm at 2 A, <= 0.1 mm at 10 A, approximately 0.5 mm at 250 A), good correlation between the incident photon position and measured position (<=0.1 mm) and further efficiency and energy resolution as for a normal proportional counter. The energy and position resolution are in agreement with the theoretical predictions. The camera can be optimized for an arbitrary wavelength band (dynamic range approximately 25) between 2 and 250 A. The camera is specifically suited for application as a focal plane instrument in a XUV survey telescope on board a satellite, which would provide typically arc minute spatial resolution and an all sky sensitivity down to 10^{-13} erg/cm^2s in a one year mission. (Auth.).

32398 **(INIS-SU—60) Teleradiometer for remote atmospheric sensing in near infrared spectr spectral region.** Barnaulova, T.V.; Valov, N.I.; Ve sman, U.K.; Villman, Ch.I.; Ganelin, G.Z.; Demidov, V.V.; Chichkin, N.A. (AN Ehstonskoj SSR, Tartu. Inst. Astrofiziki i Fiziki Atmosfery). 1980. 17p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700417.

A four-channel spaceborne teleradiometer for the measuring of optical characteristics of the atmosphere (noctilucent clouds brightness, etc.) in the near infrared spectral region is described. A rotating optical switch for periodical in-flight sensitivity testing has been installed. The main specifications of the teleradiometer: objective diameter 50 mm, mean wavelengths of spectral zone are changed between 1.2 and 2.7 μm, band half width is 0.05-0.3 μm, field of view 15 min. of arc, dynamic range 80 dB (covered with 4 amplifier outputs), measuring range of spectral densities of is equal 1f radiances-10^{-2} W.cm^{-2}. $ster^{-1}$ μm^{-1}, instrument weight 19 kg. Described teleradiometers were installed on board the orbiting space stations "Salyut 4" and "Salyut 6".

32399 **(ITEF—159(1980)) Neutron spectra measuring by magnetless hadron spectrometer.** Bayukov, Yu.D.; Buklej, A.E.; Gavrilov, V.B. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Teoreticheskoj i Ehksperimental'noj Fiziki). 1980. 19p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700418.

The energy resolution, efficiency and background conditions of neutron recording in inclusive nuclear reactions by a magnetless hadron spectrometer (MHS) in the 8-300 MeV energy range. The scheme of apparatus lay-out for measuring neutron recording efficiency is shown. For recording colliding particles with the 3 GeV/c momentum four beam scintillation counters, the latter of which of 30x40 mm dimensions and 1 mm thickness defines the working beam range in the target centre, are used. Targets of the 80 mm diameter made of C and Pb (2.08 g/cm^2 and 3.04 g/cm^2 thickness, respectively) are located at the 45 deg angle in respect to the beam direction. Secondary particles escaping at the 90 deg angle are recorded by two telescopes of the scintillation counters. For neutron and γ quanta recording the special scintillation detector of the 20 cm thickness encircled by an anticoincidence counter is used. The neutron recording efficiency is determined on the basis of comparison of the neutron production differential cross sections of the π^{+-} $^{12}C_6 \rightarrow$ nX reactions and of proton production in isotopically symmetric reactions π^{+-} $^{12}C_6 \rightarrow$ pX. The experimental data are in good agreement with the calculation data.

32400 **(ITEF—168(1980)) Xenon bubble chamber image processing on the POISK installation in the man-machine dialog regime.** Avdeev, N.F.; Barylov, V.G.; Volkov, G.A.; Demidov, V.S.; Kalinina, G.V.; Kobzarev, K.K.; Sokolov, M.M. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Teoreticheskoj i Ehksperimental'noj Fiziki). 1980. 35p. (In Russian). NTIS (US Sales Only), PC A03/MF A01. Order Number DE82700468.

Procedure for image processing of xenon bubble chamber at POISK facilities operating in the dialog regime with the BESM-4 and BESM-6 computers is stated. Primary functions of the BESM-4 computer are step-by-step observations for the measurement process and control for experimental data transmitted by the communication line. The mathematical processing of events or massives of events is accomplished by the head BESM-6 computer. To realize the dialog regime of the facility operation with the BESM-4 and BESM-6 computers used are four VT-430 displays. This permits to exchange massives of alphabetic-numeric data of considerable volume with the computers. Directives and commands used with operators of the facilities during the work at the display keyboard are given.

32401 **(ITEF—176(1980)) ADSERV computer code for data processing from proportional chambers.** Bystritskaya, E.V.; Koroleva, L.I. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Teoreticheskoj i Ehksperimental'noj Fiziki). 1980. 14p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700469.

The ADSERN program connected with processing of the data on the proportional chambers is developed in the framework of software of the "Lepton" electron experiment on EC1040. The ADSERN program performs the following procedures: the presence of the beam track trace in proportional chambers is checked; coincidence with the accuracy up to effects of multiple scattering of the colliding track parameters with parameters of one of the secondary ones (calculated earlier according to the spark chambers) is verified; secondary track coordinates are calculated according to the proportional chamber data; two tracks corresponding to muons are chosen of the found secondary tracks; according to the tracks obtained the event peak is constructed as a point of the minimum distance from the tracks with regard to its weight; the error matrix for the track and peak parameters is calculated; the calculated data on the tracks and peak are refined; the error matrix is corrected ac-

cording to all parameters. The subprograms of the given program can be used in software of other electron experiments.

32402 **(JINR—10-80-831) Compensation of nonlinear distortions in spiral reader.** Abdurakhimov, A.U.; Burov, A.S.; Kotov, V.M.; Meshcheryakov, M.G.; Nehrguj, B.; Ososkov, G.A.; Penev, V.N.; Selivanov, A.E. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Computing Techniques and Automation). 1980. 17p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700419.

Nonlinear distortion effects of Spiral Reader (SR) measurements are considered as well as methods of their compensation by software. Criteria used to detect distortions and some methods to eliminate them are described. Comparison results of the data handled on SR and on some manual measuring devices are given of the ap interation events with Psub(a)=8.5 GeV/c registered on 1 m hydrogen bubble chamber. It is shown that a spurious curvature which appears due to SR measurements could be reduced by the developed compensation methods to a negligible value.

32403 **(JINR—10-81-159) "PROSPEC" computer program complex for automatic processing of multidimensional gamma-gamma coincidence spectra.** Volkov, N.G.; Tsupko-Sitnikov, V.M.; Churakov, A.K. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Problems). 1981. 5p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700477.

From 31. Conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (1981).

The "PROSPEC" program complex designed for automatic analysis of three-dimensional A-T spectra of delayed γ-γ coincidences recorded on magnetic tape in the form of event code sequence is described. The system operates in DOS/ES system of the EC-1040 computer with the 1024 Kbyte memory. All the codes are written in FORTRAN langauge. The programs make an automatic identification of coincidence regions with a possibility of control and data reduction with the help of graphical display, identification of coincidence peak parameters and presentation of data in the form of tables and curves.

32404 **(JINR—11-81-300) Algorithm for electron fast track recongnition in C-detector of the ARES spectrometer.** Baranov, V.A.; Ilenburg, R.; Korenchenko, S.M. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Problems). 1981. 5p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700420.

An algorithm for electron fast track recognition in C-detector of ARES spectrometer created at the Laboratory of Nuclear Problems is described. The program is realized in real time mode on the EC-1040 computer. The information has been written on magnetic tape after filtering. Time needed for one track recognition is 5x10 s. The efficiency of track recognition is about 100 percent. This algorithm may be used in other experiments in the real time mode.

32405 **(JINR—13-80-808) Expansion device for a track-sensitive deuterium target.** Pozharskii, A.V.; Ustenko, E.P. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of High Energy). 1980. 7p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700422.

Targets with so-called passive expansion of medium in the target are used in known bubble chambers operating together with a track-sensitive target placed in the chamber volume. Such expansion method is realized only at the expense of the deflection of thin target walls during the pressure drop in the chamber. A design of an expansion device for the track-sensitive target containing hydrogen is considered. The device of the membrane type provides, at equal initial pressures in the chamber and target, in each expansion cycle an additional reduction of end pressure in the target to 0.3 atm relative to the chamber pressure. The device does not need an autonomous drive. Complete membrane travel is 2.0 mm. The travel is controlled remotely in some range which permits to reach the regime of synchronous tracksensitivity of medium-detectors in the chamber and target. Working models of the device were tested during the irradiation of a Ludmila device together with inner track-sensitive target in the regime of filling of chamber and target volumes with liquid hydrogen. The test results are recognized quite satisfactorily.

32406 **(JINR—E-10-80-787) Program package for data preparation of RISK events. Pt. 1. The description of program SMHV.** Denes, E.; Wagner, I.; Nagy, J. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Problems). 1980. 12p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700479.

A FORTRAN program package written for the CDC-6500 computer is presented. The SMHV program is designed to transform data obtained from events of RISK streamer chamber by means of measuring SAMET or PUOS devices to the HEVAS data tormat format needed by the geometrical reconstruction program. Such a transformation provides the standartization of measurement data procession inside the RISK collaboration and capability of the direct input into program of event geometrical reconstruction registered on a film of RISK streamer chamber.

32407 **(JINR-R—1-81-30) Wide-aperture gas threshold Cherenkov counter.** Bitsadze, G.S.; Blik, A.M.; Budagov, Yu.A. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Problems). 1981. 6p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700423.

The wide-aperture gaseous threshold Cherenkov counter for identification of secondary charged particles (π, k) in the 5-17 GeV/c region is described. The counter case consists of a changeable steelpipe of 500 mm internal diameter and a head inside which there is a spherical mirror of 580 mm diameter. The inclination angle of the spherical mirror to the counter axis constitutes 23 deg 30'. For registering the Cherenkov radiation the XP2041/Q photomultiplier with a quartz window is used. As a working gas freon-12 or air can be used. The radiator length of the Cherenkov counter is 1380 mm and the working pressure must not exceed 1.7 atm. The counter performances have been investigated on a pion beam. Experimental threshold curves of a counter with freon-12 and air radiators are presented. The counter efficiency with the freon-12 radiator when registering 7 and 11 GeV/c pions is not worse than 99.99%. It has been found that the particle detecting efficiency is independent of their flight angle 0 deg - 11 deg in the angle range. The resolution over velocity measured is $3.5 \cdot 10^{-5}$.

32408 **(JINR-R—10-81-56) Organization of number sets input/output in the spectrum processing system.** Buttseva, G.L.; Mircheva, D.; Nefed'eva, L.S.; Tarasova, V.N.; Uspanova, G.Sh.; Tsehrehndulam, D.; Yagafarova, V.M. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Computing Techniques and Automation). 1981. 11p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700484.

A system of programs providing the input-output of number data into files (from files) of the spectrum processing system (SPS) is described. The SPS created within the "Dubna" monitor system on the BESM-6 computer is a part of software of a unified system of processing spectrometric information at the JINR and serves for processing information obtained on other computers. It provides the data input from various carriers: punched cards, magnetic tapes of ES-5012, CDC-608, BESM-6 type and via a cable bond line. Some problems of data transformation into numerical structure of the BESM-6 computer, recording, its compression and data formulation as files in the SPS, are also considered.

32409 **(JINR-R—10-81-315) Program generation as a software maintenance in big program systems.** Govorun, N.N.; Ivanov, V.G.; Strizh, T.A. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Computing Techniques and Automation). 1981. 8p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700481.

A special generation system which allows users to collect needed programs by inquiring in a special language is developed. Principles of this system organization and main reasons for its construction are considered. Some problems which a programmer solves during the big program system exploitation are also considered. The special generation system provides the user with simple

and convenient facilities for solving the following problems: to collect program with the help of user's inquiry; to control printout and editing constants; to create program libraries for data processing. This provides solving of some problems in software maintenance for film information processing by JINR users. Principles of such generation system for operation in batch or dialog mode on CDC-6500 computer are presented.

32410 **(JINR-R—10-81-316) General organization of program generation system for film data processing.** Badalyan, S.G.; Buzdavina, N.A.; Dirner, A.; Ivanov, V.G.; Strizh, T.A. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Computing Techniques and Automation). 1981. 8p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700482.

The program generation system organization for film data processing which consists of a program generator, control program and data bank is described. The generation technique is a superstructure under basic software in PAM-file form. It widely uses PATCHY-4 facilities. The information provision of a system is realized in the form of CCL language procedures. The whole system is recorded as PAM-files. Together with the use of mnemonics in choosing the names of different system components this.allows one to automate the procedure of searching for needed dictionaries file catalogue etc. along with economic expenditure of resources of external memory. Besides, this organization easily allows one to add new data to the system when new program and packages are connected to it. The system is realized on the CDC-6500 computer.

32411 **(JINR-R—13-81-18) Neutron detector for detecting rare events of spontaneous fission.** Ter-Akop'yan, G.M.; Popeko, A.G.; Sokol, E.A.; Chelnokov, L.P.; Smirnov, V.I.; Gorshkov, V.A. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Reactions). 1981. 11p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700426.

The neutron detector for registering rare events of spontaneous fission by detecting multiple neutron emission is described. The detector represents a block of plexiglas of 550 mm diameter and 700 mm height in the centre of which there is a through 160 mm diameter channel for the sample under investigation. The detector comprises 56 ^{3}He filled counters (up to 7 atm pressure) with 1% CO_2 addition. The counters have a 500 mm length and a 32 mm diameter. The sampling of fission events is realized by an electron system which allows determining the number of detected neutrons, numbers of operated counters, signal amplitude and time for fission event detecting. A block diagram of a neutron detector electron system is presented and its operation principle is considered. For protection against cosmic radiation the detector is surronded by a system of plastic scintillators and placed behind the concrete shield of 6 m thickness. The results of measurements of background radiation are given. It has been found that the background radiation of single neutron constitutes about 150 counts per hour, the detecting efficiency of single neutron equals 0.483 +- 0.005, for a 10l detector sensitive volume. By means of the detector described the parameters of multiplicity distribution of prompt neutrons for ^{256}Fm spontaneous fission are measured. The average multiplicity equals 3.59+-0.06 the dispersion being 2.30+-0.65.

32412 **(JINR-R—13-81-74) Light collection in large liquid scintillation counters with dacron foil wall.** GoloVin, V.M. (Joint Inst. for Nuclear Research, Dubna (USSR). Dept. of New Acceleration Methods). 1981. 6p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700428.

Light collection characteristics in large (approximately 10 m of length) cylindrical liquid scintillation counters on the basis of water or white-spirit have been obtained by computer calculations. Their wall was prepared of dacron foil of various thickness. Experimental values of optical parameters for dacron foils are used. The analytical expression which contains fitting parameter is proposed for calculation of these characteristics. The calculation results agree well with the experimental data.

32413 **(JINR-R—13-81-298) Pressurised position sensitive detector for gamma detection.** Zanevskii, Yu.V.; Kalantarov, K.D.; Matyushevskii, E.A.; Movchan, S.A.; Netusilova, Z.; Rozhnyatovskaya, S.A.; Peshekhonov, V.D. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of High Energy). 1981. 8p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700427.

The construction of a detector is described, and results of studies are given. The detector is intended for gamma-detection an energy range of 50-90 keV. It is a proportional chamber with 2 drift gaps. The working mixture is xenon with 10% CH_4. The working pressure of the gas is 5 atm. The space resolution of the detector is better than 2 mm at a good contrast ratio and a gamma detection efficiency about 30%.

32414 **(JINR-R—16-81-330) Dependence of LiF thermoluminescent detector response positioned behind different absorbers on energy of gamma radiation.** Komochkov, M.M.; Tsovbun, V.I. (Joint Inst. for Nuclear Research, Dubna (USSR). Dept. of Radiation Safety). 1981. 7p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700430.

Sensitivities of LiF thermoluminescent detectors are measured on gamma ray isotope sources within the 22.5 keV upto 1.25 MeV energy range. As absorbers teflon, aluminium, iron and lead of 0.53-21.8 g/cm thick were used. A method of calculating sensitivity functions is proposed. The calculation results agree with the measurement data. The possibilities are discussed of reconstructing the gamma radiation energy distributions with the application of sensitivity functions to problems of dosimetry, protection and estimation of material radioactive loads.

32415 **(KAERI/RR—218/80) Development of portable survey meter.** Ha, C.W.; Suh, K.W.; Lee, K.C.; Lee, H.Y.; Kim, C.S.; Chung, C.T. (Korea Advanced Energy Research Inst., Seoul (Republic of Korea)). 1980. 126p. (In Korean). NTIS (US Sales Only), PC A07/MF A01. Order Number DE82700431.

The purpose of outgassing is to remove from the GM counter tube electronegative gases and other impurities through the vacuum evacuation and baking method, which interfere with counter operation due to spurious count, in addition to the conventional outgassing method. The new advanced method has been developed in this investigation, i.e., deposition of thin conductive metal film of tindioxide (SnO_2) on the inner surface of glass envelope to prevent release of occluded and absorbed gases other than filling gas from cathode assembly into the sensitive volume of GM counter tube. The thin tindioxide film has good electrical conductivity as a function of cathode material and also good mechanical cohesive power. However, there remain further technical procedures to obtain homogeneous thin metal film. The method of sealing tungsten to pyrex glass was employed in this investigation and found the results very satisfactory. This was accomplished by having the small tungsten leads which sealed through the pyrex glass envelope.

32416 **(KIYI—80-8) Laser application for detector system adjustment in a reaction chamber.** Grantsev, V.I.; Dryapachenko, I.P.; Kornilov, V.A.; Nemets, O.F.; Rudenko, B.A.; Sokolov, M.V.; Struzhko, B.G.; Gnatovskii, A.V.; Bojchuk, V.N. (AN Ukrainskoj SSR, Kiev. Inst. Yadernykh Issledovanij). 1980. 8p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700433.

A method of optical adjustment of detector system on U-240 cyclotron by means of laser and holographic diffraction lattices as described. Helium-neon laser of 2 μW is distributed along the geometric axis of the experimental plant during simulating the experiment parameters. The target was substituted by holographic diffraction lattice in the form of photofilm. Beams, deviated under different known angles, were used as reference point for detector adjustment. Determination accuracy of angular reference point beams within 0+-80 deg limits constituted 0.005 deg, accuracy of detector fixing in the reaction plane approached 0.01 deg by asimuthal angle. Application of laser and holograms gives wide prospects for experiment geometry simulation by studying nuclear reactions.

32417 (NIIAR—41(449)) Programmable α-spectrometer for radiochemical studies. Pevtsov, V.V.; Pushkarskii, N.I.; Efremov, Yu.V.; Loginov, V.D.; Shipilov, V.I.; Anokhin, Yu.P. (Nauchno-Issledovatel'skij Inst. Atomnykh Reaktorov, Dimitrovgrad (USSR)). 1980. 8p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700434.

The description of a programmable α-spectrometer developed on the base of an immersed spectrometric surface-barrier detector and the 15 VSM-5 microcomputer is given. Possibilities of spectrometer application for studying Am and Cm behaviour on the AHKF-6 ion-exchange resin and Am and Cm on zorconium phosphate are investigated. The results on determining Am and Cm distribution coefficients on the ion-exhcnage resin and changing their activities depending on ph solution during their sorption on zirconium phosphate. The data presented testify to the prospects of described spectrometer application in systems of remote express control for the α-radioactive elements distribution in various radiochemical processes of transplutonium elements extraction of irradiated materials as it gives the possibility to obtain data on the progress of a technological process simultaneously with its course and in the case of any deflections to realize a proper correction of its parameters.

32418 (NRPB-R—113) Statistical aspects of the interpretation of counting experiments designed to detect low levels of radioactivity. Sumerling, T.J.; Darby, S.C. (National Radiological Protection Board, Harwell (UK)). Mar 1981. 31p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE82700435.

This report describes the statistical aspects of interpreting the results of counting experiments designed to detect low levels of radioactivity when the detector efficiency is known. The topic is discussed first from a general point of view and then the details of the methods are presented for both well-known and poorly-known backgrounds. A treatment of uncertainties arising from factors other than the counting statistics is not provided. A quick reference guide to the formulae necessary for the methods and for the reporting of results is provided. Examples demonstrating the use of the methods and tables for applying them are also given.

32419 (PEL—275) In vivo measurement of uranium in the human chest under high background conditions. Kruger, P.J.; Feather, J.I. (Atomic Energy Board, Pelindaba, Pretoria (South Africa)). Aug 1981. 13p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700436.

The use of a low-background counting room was considered essential for in vivo gamma counting of uranium in the human chest. When such measurements were, however, carried out under relatively high background conditions, this necessitated a new method of analysis. It was found that a linear relationship between LnN and E exists for each individual where N is the count rate per keV and E the energy in keV, for gamma energies between 90 keV and 300 keV. The displacements from this straight line at the energy values of 90 and 186 keV then represent the contribution of the uranium present. These displacements were calibrated for natural uranium. It was possible to detect contamination levels of lower than half MPLB.

32420 (PEL—277) Effect of elastically scattered protons on the energy resolution of x-ray detectors in PIXE measurements. Mingay, D.W.; Stadler, E. (Atomic Energy Board, Pelindaba, Pretoria (South Africa)). Aug 1981. 13p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700437.

Extensive use has been made of particle-induced X-ray emission (PIXE) analysis over the past several years. The optimisation of its detection sensitivity calls for the judicious selection of several parameters including, inter alia, the beam energy used and the X-ray window thickness. Thin windows are required in order to be able to detect the light elements whose X-ray energies are so low that they are heavily attenuated by any absorber material between the target and the detector. The choice of beam energy is dependent on the respective cross sections for X-ray production for elements of interest, the related background generated, as well as the associated beam energy degradation in the targets. These considerations often lead to a state where protons, elastically, scattered from the target, have sufficient energy to penetrate the window and enter the X-ray detector. The extent to which such protons and their related secondary electron production affect the energy resolution of an intrinsic germanium X-ray detector is demonstrated for a proton beam energy range from 2,1 to 3,5 MeV with a window thickness equivalent to the range of a 2,5 MeV proton.

32421 (RL—81-053) High resolution, high counting rate bidimensional, MWPC imaging detector for small angle X-ray diffraction studies. Bateman, J.E.; Connolly, J.F.; Sawyer, E.C.; Stephenson, R. (Science Research Council, Chilton (UK). Rutherford and Appleton Labs.). Jul 1981. 23p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700438.

The performance is reported of a 200 mm x 200 mm X-ray imaging MWPC aimed at applications in small angle X-ray diffraction and scattering. With quantum energies of approximately 8 keV high spatial resolution (+- 0.5 mm x +- 0.14 mm) with a capability for data taking at >approximately 350 kHz is reported. The detection efficiency is approximately 75% and the detector operates as a sealed unit with a long lifetime.

32422 (SLAC—245, pp 381-401) Upsilon physics with CUSB. Lee-Franzini, J. (SUNY at Stony Brook, New York). Jan 1982. NTIS, PC A99/MF A01.

From Summer institute on particle physics; Stanford, CA, USA (27 Jul 1981).

In the past fifteen months CESR (the Cornell Electron Storage Rings) has delivered upwards of 18,000nb^{-1} of integrated luminosity, distributed over the energy range spanned by the Y-family. The CUSB Collaboration whose detector is located in the North Area, in our central detector, have collected $\leqq$ 60,000 $e^+e^- \rightarrow$ hadrons events. Of these, 6000 are at the Y (16% of which are due to the continuum under the resonance), 14,000 at the Y' (21% continuum), 9000 at the Y''(33% continuum) and 16,000 at the Y''' (70% continuum); 6000 at the region between Y'' and Y''', 4000 above the Y'''. A plot of the visible cross section resulting from these events as a function of total c. of m. energy is shown. The present paper reports on the results from the analyses of these data, most of which are still underway, hence maybe of a preliminary nature. Caveats aside, the major results are given.

32423 Gas mixtures for gas-filled radiation detectors. Carter, J.G.; Christophorou, L.G.; Maxey, D.V.; Mccorkle, D.L. (to Department of Energy). US Patent 4,309,307. 5 Jan 1982. Filed date 28 Mar 1980. vp.

PAT-APPL-134815.

Improved binary and ternary gas mixtures for gas-filled radiation detectors are provided. The components are chosen on the basis of the principle that the first component is one molecular gas or mixture of two molecular gases having a large electron scattering cross section at energies of about 0.5 ev and higher, and the second component is a noble gas having a very small cross section at and below about 1.0 ev, whereby fast electrons in the gaseous mixture are slowed into the energy range of about 0.5 ev where the cross section for the mixture is small and hence the electron mean free path is large. The reduction in both the cross section and the electron energy results in an increase in the drift velocity of the electrons in the gas mixtures over that for the separate components for a range of e/p (Pressure-reduced electric field) values. Several gas mixtures are provided that provide faster response in gas-filled detectors for convenient e/p ranges as compared with conventional gas mixtures.

32424 Synchrotron radiation sources for photobiology and ultraviolet, visible and infrared spectroscopy. Sutherland, J.C. (Brookhaven National Lab., Upton, NY). pp 11-19 of Trends in photobiology. Helene, C.; Charlier, M.; Montenay-Garestier, T.; Laustriat, G. (eds.). New York, NY; Plenum Publishing Corporation (1982).

The advantages of synchrotron radiation in several types of spectroscopy, microscopy and diffraction studies are examined. The availability of synchrotron radiation will expand rapidly in the

early 1980's as experimental programs start at the new generation of dedicated storage rings.

32425 **Neutron probe and the detection of soil moisture.** Luft, G.; Morgenschweis, G. *Wasser und Boden;* **33**: No. 11, 545-549(Nov 1981). (In German).

The authors present a brief outline of the direct and indirect field methods used at present in soil moisture measurement; particularly the advantages and disadvantages of neutron diffusion measurement are illustrated by means of various types of instruments available. The recently developed Wellingford Neutron Moisture Probe IH II, used for hydrological and pedohydrological fieldwork respectively, is presented and the first test results concerning the handling, measuring time, measured volume and layer thickness are discussed.

32426 **Germanide formation by thermal treatment of platinum films deposited on single-crystal Ge<100> substrates.** Grimaldi, M.G.; Wielunski, L.; Nicolet, M.A.; Tu, K.N. *Thin Solid Films;* **81**: No. 3, 207-211(24 Jul 1981).

The reaction of platinum films about 450 A thick which had been vacuum deposited onto Ge<100> substrates was investigated by backscattering spectrometry and X-ray diffraction. It was found that the procedure for cleaning the germanium is critical. If the cleaning is inadequate, no reaction is observed on thermal annealing in vacuum up to 300-350°C, and a laterally non-uniform reaction starts suddenly above that temperature. A cleaning process described that reproducibly leads to laterally uniform compound formation above 250°C. The compounds Ge_2Pt_3, GePt, Ge_3Pt_2 and Ge_2Pt are observed by backscattering spectrometry in sequential order for 30 min annealings up to 450°C. The GePt phase formed at 300°C was identified by X-ray diffraction. These results are relevant to the formation of contacts to high purity germanium radiation detectors.

32427 **Advances in detectors for Dumand arrays.** McGibney, D.J.; Roberts, A. (Hawaii Univ., Honolulu (USA)); Camerini, U. (Wisconsin Univ., Madison (USA)). pp 144-146 of Conference papers. 17. International cosmic ray conference, Paris, 13-25 July 1981. Vol. 7, MN Session. Paris, France; Commissariat a l'Energie Atomique (1981).

From 17. international cosmic ray conference; Paris, France (13 Jul 1981).

The spacing of optical detectors in a DUMAND array depends critically upon their sensitivity; and the total number of sensors for a given detector volume will of course vary inversely as the cube of their spacing. Consequently it has been a long-term objective of DUMAND to increase the sensitivity of available detectors, until a critical value is reached at which increasing sensor-related costs -the sensor itself, its packaging, associated equipment and deployment- outstrip the savings consequent upon decreasing the total number of sensors. Following a suggestion of R. Winston, we have extensively explored a geometry of wavelength-shifting sensors (WLSS) that we have called Sea Urchin, which remains the best of all WLSS tested to date. In this design a hemispherical-cathode photomultiplier tube is optically coupled to a large number of radial "spines", each a transparent tube filled with a wavelength-shifting solution. Extensive laboratory tests on fluors, solvents, spine materials, etc., and extensive Monte Carlo studies of spine optics, self-shadowing by the array of spines, and related matters, have led to a final design of Sea Urchin which we now consider the best achievable at this time.

32428 **Fluorescent light detector in Dumand.** Kitamura, T.; Mitsui, K.; Saito, T. (Tokyo Univ., Tanashi (Japan). Cosmic Ray Lab.); Okamoto, Y. (Waseda Univ., Tokyo (Japan)). pp 147-150 of Conference papers. 17. International cosmic ray conference, Paris, 13-25 July 1981. Vol. 7, MN Session. Paris, France; Commissariat a l'Energie Atomique (1981).

From 17. international cosmic ray conference; Paris, France (13 Jul 1981).

It is important to design the most efficient and cheapest Cherenkov light detector with a large area for DUMAND project. The light collectors of long glass pipe with 2 cm diameter were tested using various fluors and solvents suggested by Roberts and Learned. In the case of Hostasol Yellow 8G, the measured values are shown to be consistent with ones evaluated from the emission and absorbent rates of the fluor and the quantum efficiency of the photo multiplier used. Another type of light detector will be discussed.

32429 **Characteristics of electronics components under high pressure.** Aoki, T.; Ohashi, Y. (Tokyo Univ., Tanashi (Japan). Cosmic Ray Lab.); Nakamura, I. (Nagoya Univ. (Japan). Dept. of Physics). pp 151 of Conference papers. 17. International cosmic ray conference, Paris, 13-25 July 1981. Vol. 7, MN Session. Paris, France; Commissariat a l'Energie Atomique (1981).

From 17. international cosmic ray conference; Paris, France (13 Jul 1981).

32430 **Oceanographic studies for Dumand.** Andrews, J. (Norda, MS (USA)); Blackinton, G.; Learned, J.; Stroup, E.D. (Hawaii Univ., Honolulu (USA)); Bradner, H. (California Univ., San Diego (USA)); Zaneveld, R. (Oregon State Univ., Corvallis (USA)). pp 152 of Conference papers. 17. International cosmic ray conference, Paris, 13-25 July 1981. Vol. 7, MN Session. Paris, France; Commissariat a l'Energie Atomique (1981).

From 17. international cosmic ray conference; Paris, France (13 Jul 1981).

32431 **Ultra high energy primary composition and interaction studies with Dumand.** Allkofer, O.C.; Grieder, P.K.F. (Bern Univ. (Switzerland). Physikalisches Inst.). pp 153-156 of Conference papers. 17. International cosmic ray conference, Paris, 13-25 July 1981. Vol. 7, MN Session. Paris, France; Commissariat a l'Energie Atomique (1981).

From 17. international cosmic ray conference; Paris, France (13 Jul 1981).

Some time ago we have proposed the installation of a low energy muon detector array, submerged at a depth of 50 m below sea level, centered above DUMAND, to carry out air shower studies and anisotropy measurements with this system. In this context we discuss a variety of problems concerning high energy interactions and primary composition studies that could be approached if both systems could be operated simultaneously.

32432 **Muons with high energy transfer in Dumand.** Dau, W.D.; Boehm, E. (Institut fuer Kernphysik, Kiel (Germany, F.R.)). pp 157 of Conference papers. 17. International cosmic ray conference, Paris, 13-25 July 1981. Vol. 7, MN Session. Paris, France; Commissariat a l'Energie Atomique (1981).

From 17. international cosmic ray conference; Paris, France (13 Jul 1981).

32433 **Separation of hadronic and electromagnetic interactions of muons in Dumand.** Boehm, E.; Dau, W.D.; Jokisch, H. (Institut fuer Kernphysik, Kiel (Germany F.R.)). pp 158 of Conference papers. 17. International cosmic ray conference, Paris, 13-25 July 1981. Vol. 7, MN Session. Paris, France; Commissariat a l'Energie Atomique (1981).

From 17. international cosmic ray conference; Paris, France (13 Jul 1981).

32434 **Sensitivity of Dumand arrays to extraterrestrial neutrino fluxes.** Stenger, V.J. (Hawaii Univ., Honolulu (USA)). pp 163-166 of Conference papers. 17. International cosmic ray conference, Paris, 13-25 July 1981. Vol. 7, MN Session. Paris, France; Commissariat a l'Energie Atomique (1981).

From 17. international cosmic ray conference; Paris, France (13 Jul 1981).

The minimum detectable flux of extraterrestrial neutrinos for a range of DUMAND array sizes is calculated. Expressed in terms of the integral flux in $cm^{-2}s^{-1}$ above 1 TeV, the results are of the order of 10^{-10} for ν/sub μ/, 10^{-9} for ν/sub e/. The astrophysical significance is briefly discussed.

32435 **Experiment project of $\mu\nu$ detection in shallow underwater.** Liu, Z.; Geng, Q.; Bai, G.; Li, G.; Liu, J. (Cosmic Ray Research Group, Chongqing Architectural Engineering Institute, Chongqing (China)). pp 167 of Conference papers. 17. International cosmic ray conference, Paris, 13-25 July 1981. Vol. 7, MN Session. Paris, France; Commissariat a l'Energie Atomique (1981).

From 17. international cosmic ray conference; Paris, France (13 Jul 1981).

The DUMAND is known as an effective arrangement for $\mu\nu$ detection. But it should be installed at a very deep depth and, consequently, difficult to construct. In order to get some experience for the $\mu\nu$ underwater detection and carry out some experiments as earlier as possible, a project of shallow underwater $\mu\nu$ detection is proposed.

32436 **Neutrino moments: the applications for calculation of the rate of events in neutrino detectors.** Berezinski, V.S.; Gazizov, A.Z. (AN SSSR, Moscow. Inst. Yadernykh Issledovanij). pp 172-175 of Conference papers. 17. International cosmic ray conference, Paris, 13-25 July 1981. Vol. 7, MN Session. Paris, France; Commissariat a l'Energie Atomique (1981).

From 17. international cosmic ray conference; Paris, France (13 Jul 1981).

For power-law high energy neutrino spectra the rate of events of different types (hadron cascades with energy E/sub h/, muons with energy E/sub μ/ etc) produced in a neutrino detector is directly and simply connected with neutrino moments, which numerical values are presented here.

32437 **Applications of the Cleveland salt mine detector to cosmic rays and cosmology.** Bionta, R.; Cortez, B. (Michigan Univ., Ann Arbor (USA). Dept. of Physics); Bratton, C. (Cleveland State university, Cleveland, OH (USA)). pp 184 of Conference papers. 17. International cosmic ray conference, Paris 13-25 July 1981. Vol. 7, MN Session. Paris, France; Commissariat a l'Energie Atomique (1981).

From 17. international cosmic ray conference; Paris, France (13 Jul 1981).

32438 **Detection of the nucleon decays by the calorimeter composed of the neon flash chambers.** Ozaki, S. (Osaka Univ. (Japan)). pp 186 of Conference papers. 17. International cosmic ray conference, Paris 13-25 July 1981. Vol. 7, MN Session. Paris, France; Commissariat a l'Energie Atomique (1981).

From 17. international cosmic ray conference; Paris, France (13 Jul 1981).

32439 **μ-e decay investigation at the Mt. Blanc station.** Dadykin, V.L.; Korchagin, V.B.; Mal'gin, A.S. (AN SSSR, Moscow. Inst. Yadernykh Issledovanij). pp 187-190 of Conference papers. 17. International cosmic ray conference, Paris 13-25 July 1981. Vol. 7, MN Session. Paris, France; Commissariat a l'Energie Atomique (1981).

From 17. international cosmic ray conference; Paris, France (13 Jul 1981).

The flux of stopping muons was measured at the Mt. Blanc Laboratory, at a depth of 4270 MWe underground. Preliminary results show that the ratio between stopping and throughgoing muons for 100 g cm^{-2} is R = (3.85 +- 0.6) 10^{-3}, in agreement with theoretical values for such a depth.

32440 **Applied aspects of cosmic ray investigation.** Friedman, S.D. (AN SSSR, Moscow. Inst. Prikladnoj Geofiziki); Kolomeets, E.V.; Pfeffer, P.G.E.; Oskomov, V.V. (AN Kazakhskoj SSR, Alma-Ata. Astrofizicheskij Inst.). pp 192 of Conference papers. 17. International cosmic ray conference, Paris 13-25 July 1981. Vol. 7, MN Session. Paris, France; Commissariat a l'Energie Atomique (1981).

From 17. international cosmic ray conference; Paris, France (13 Jul 1981).

The paper represents the results of application of cosmic rays to solution of applied problems: determination, of water resource of snow and moisture of soils and determination of structure, speed, and rate of mud flows.

32441 **Influence of radiation detector dead time upon count rate statistics.** Csirik, J. *Nuc Compact, Compact News in Nuclear Medicine;* **11**: No. 4, 141(Sep 1980). (In German).

The influence of radiation detector dead time upon count rate statistics (anti x,asub(x)^2) was investigated and it could be shown that the variance at 10000 cps and 10 μsec dead time is smaller by 8% than than that expected by the Poisson-law.

4403 Miscellaneous Instruments

REFER ALSO TO CITATION(S) 31942, 31945, 32002, 32467, 32544

32442 **(AECL—7523-Vol.1) Eddy-current testing: manual on eddy-current method.** Cecco, V.S.; van Drunen, G.; Sharp, F.L. (Atomic Energy of Canada Ltd., Chalk River, Ontario. Chalk River Nuclear Labs.). Nov 1981. 205p. Chalk River Nuclear Laboratory, Chalk River, Ontario, Canada KOJ 1JO.

Portions of document are illegible.

Those involved in eddy current testing are provided with both the fundamental principles of the technique as well as the knowledge to deal with often complicated test results. A non-rigorous approach is used to simplify complex physical phenomena. Emphasis is placed on proper choice of test frequency and signal interpretation. Defect detection and diagnosis receive particular attention. Design and construction of probes are covered extensively since probes play a key role in eddy current testing. The advantages and limitations of various probe types are discussed. Electromagnetic theory, instrumentation, test methods and signal analysis are covered. Simplified derivations of probe response to test parameters are presented to develop a basic understanding of eddy current behavior. Eddy current signals are presented on impedance plane diagrams throughout the manual since this is the most common display on modern, general purpose instruments. The use of phase lag in signal analysis is covered in detail. To supplement theory, practical examples are presented to develop proficiency in performing inspections, and to illustrate how basic principles are applied to diagnose real signals.

32443 **(AERE-R—10207) Design of a servo system for a Moessbauer spectrometer.** Cranshaw, T.E. (UKAEA Atomic Energy Research Establishment, Harwell. Nuclear Physics Div.). Jun 1981. 17p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700073.

This report describes the design of a transducer system and servo drive amplifier suitable for Moessbauer spectrometers. Particular attention is paid to low and zero frequency drift. Measurements of the loop gain of a practical system are presented.

32444 (GSI—81-2, pp 242) **On-line phase and amplitude measurement of pulsed rf at 27 and 108 MHz.** Losert, W.; Strehl, P.; Vilhjalmsson, H.; Wilms, D. Mar 1981. NTIS (US Sales Only), PC A16/MF A01.

In Scientific report 1980.

32445 (GSI—81-2, pp 246) **Hall probe applications.** Steiner, R. Mar 1981. NTIS (US Sales Only), PC A16/MF A01.

In Scientific report 1980.

32446 (GSI—81-2, pp 196) **Eight crystal X-ray spectrometer.** Dohmann, H.D.; Mann, R.; Pfeng, E. Mar 1981. NTIS (US Sales Only), PC A16/MF A01.

In Scientific report 1980.

32447 (GSI—81-2, pp 197) **Experimental setup for high resolution Auger electron and X-ray spectroscopy.** Mann, R.; Beyer, H.F.; Schartner, K.H. Mar 1981. NTIS (US Sales Only), PC A16/MF A01.

In Scientific report 1980.

32448 **(IFVE-ONF—81-5) Inverse problem and account of the instrument resolution function.** Zhigunov, V.P. (Gosudarstvennyj Nauchno-Issledovatel'skij Inst. Tsvetnykh Metallov, Moscow (USSR)). 1981. 16p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700465.

The methods of evaluation of the studied P(X) distribution by experimental results, $\pi(X)$ with account of the instrument resolution function are described. The P(X) evaluation is performed for two cases, namely, when a resolution function is an operator of full rank and when it is an operator of incomplete rank. For obtaining P(X) evaluation the regularization method (in both cases) and the least square method (suitable only for the first case) are used. Statistical interpretation of the regularized solution is given and an effective calculational method to find a solution is proposed. The method evidently accounts of the fact that the number of measurements is finite. This leads to specific properties of the solution as a random function.

32449 **(ITEF—112(1980)) Units of reprogramming memory devices in the Camac-Vector systems.** Shvachkin, V.B.; Semenov, Yu.A. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Teoreticheskoj i Ehksperimental'noj Fiziki). 1980. 18p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700441.

The storage system with 64x24 bit units incorporating the programmer for the information recording by the command method and the constant block with the RPSD (reprogramming storage device) of 32x16 bit dimensions and with manual recording developed on the base of RPSD of the K 519 series in the CAMAC-VECTOR standard, are described. The organization, main characteristics and logic diagrams of the storage unit an constant block are considered. It is noted that the use of the RPSD system with the electric information change on microcircuits of the K519PE2 series provides high noise immunity at high level of fast responce and informative capacity. Introduction into the system of a special recording unit -programmer - permits to record programs debugging by a computer to the storage device by means of a standard command method of the CAMAC-VECTOR systems.

32450 **(JINR—1-81-29) Units for output of graphical information on display in the "Crystal" experiment.** Guzik, Z.; Forycki, A. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of High Energy). 1981. 7p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700442.

The controller and digital-to-analog converter for output graphical information onto the TEKTRONIX 613 display in the "Crystal" experiment are described. The controller allows one to construct image consisting of relative and absolute points, horizontal and vertical vectors and also from alphanumeric ASCII symbols. The devices are compatible with CAMAC and can be used for storage and refreshing tubes.

32451 **(JINR—13-81-11) Multi-channel amplitude analyzer on the basis of the MERA-60 microcomputer.** Fefilov, B.V.; Nguen Khak Tkhi. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Reactions). 1981. 4p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700444.

4096-channel amplitude analyzer on the base of the MERA-60 micro-computer, using standard CAMAC modules is developed and produced for acquisition and processing spectrometric data on activation analysis. Given are description and flow-sheet of multichannel analyzer, the main elements of which are amplitude coder, television monitor with driver the MERA-60 microcomputer adapter and interface. The MERA 6 microcomputer comprises processor of 4K words of memory, additional memory of 4K words, terminal board, photoreader and puncher board. The analyzer performs the following types of data processing: energy spectra calibration by two peaks, spectra smoothing their integrating and data input-output on punched tape. A set of programs-AKTAN-60 with 4K words of memory is developed for storage control and processing of the data.

32452 **(JINR-R—10-81-83) Control algorithms for scanning device AELT-2/160. Pt. 1.** Baranchuk, M.K.; Kryukova, L.M.; Lapchik, Eh.D.; Naumov, B.P.; Stuk, G.P.; Tutyshkina, L.V.; Shkundenkov, V.N. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Computing Techniques and Automation). 1981. 12p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700445.

The AELT-2/160 measuring system on a cathode-ray tube cotrolled by the BESM-4 computer is described. The work consists of the following parts: apparatus of measuring system on a CRT; technical realization of the system control; commands and algorithms for exchange and dialogue between all the facilities of the system. The principal facilities of the measuring system are: a scanning device on CRT; functional keyboard; videoamplifiers; a display monitor; a display with magnetic drum; a VT-340 display; a film transport; a transparency. Authors recommendations were used in a system of programs for processing films obtained from the MIS setup. More than 15000 events have been processed during 1979-1980.

32453 **(KAERI/RR—262/80) Development of nondestructive testing technique. Ultrasonic testing and radiographic testing.** Lee, Y.P.; Ryoo, K.K.; Ahn, H.S.; Chung, Y.M.; Kang, S.C. (Korea Advanced Energy Research Inst., Seoul (Republic of Korea)). 1980. 216p. (In Korean). NTIS (US Sales Only), PC A10/MF A01. Order Number DE82700448.

The experimental study of determining defect size by ultrasonic testing with artificial reference block and maximum echo is described in this report. The design and fabrication of various necessary calibration blocks being used artificial block were carried out according to exciting ASME code and standard. A container for Co 60, 10 Ci was designed to apply radioisotope for radiographic testing. Neutron radiographic testing using thermal neutron flux ($1.7 \times 10^{6-7}$ N/cm^2-sec) produced from the reactor (250 KW) was attempted and compared with X-ray radiographic testing. The study of thickness measurement of boiler tubes for paper mill was successfully carried out.

32454 (SAND—82-0425, pp 7-16) **Silicon semiconductors.** Sinclair, P.L. (Schlumberger Well Services, Houston, TX). Feb 1982. NTIS, PC A09/MF A01.

From IEEE high temperature electronics and instrumentation conference; Houston, TX, USA (7 Dec 1981).

Progress in high temperature electronics using silicon semiconductor technology is summarized. The limits of silicon are defined in terms of reliability, electrical performance and availability. Developments are briefly described in laser recrystallized silicon-on-insulator, improved silicon-on-sapphire, and ion-implanted oxides, which show promise for improving the quality of the isolation between active elements. (LEW)

32455 (SAND—82-0425, pp 85-90) **High temperature electronics in space applications.** Jurgens, R.F. (Jet Propulsion Lab., Pasadena, CA); Borden, T.; Curkendall, D.; Elson, L.; Preston, R.; Blamont, J.; Letki, F. Feb 1982. NTIS, PC A09/MF A01.

From IEEE high temperature electronics and instrumentation conference; Houston, TX, USA (7 Dec 1981).

Various possible space applications and the necessary instrumentation are discussed briefly. Most emphasis is placed on the region 38 to 45 km altitude, using a lukewarm balloon. The instrument electronics for such a mission is described. Diagrams of the instrument package and its various components are included. (MHR)

32456 (SAND—82-0425, pp 93-100) **Design and application of -55°C to +200°C hybrid data converters.** Prazak, P.R. (Burr-Brown Research Corp., Tucson, AZ). Feb 1982. NTIS, PC A09/MF A01.

From IEEE high temperature electronics and instrumentation conference; Houston, TX, USA (7 Dec 1981).

The design of a full 12 bit successive approximation hybrid analog-to-digital converter is described that is specified to operate over a temperature range of -55°C to +200°C. The device uses

commercially available silicon integrated circuits as well as thin-film and thick-film technologies. Details of the design, construction, and application of this device, as well as 1000 hour life test data at +200°C ambient temperature, are presented.

32457 (SAND—82-0425, pp 101-106) **Characteristics of three voltage regulators at high temperatures.** Patterson, D.O. (Naval Research Lab., Washington, DC); Hollowell, K. Feb 1982. NTIS, PC A09/MF A01.

From IEEE high temperature electronics and instrumentation conference; Houston, TX, USA (7 Dec 1981).

The performance and survivability of voltage regulator circuits exposed to high temperatures for short periods of time are studied. The parts chosen for the study were three commercial monolithic voltage regulator integrated circuits widely used in military systems. They are all found to function to above 200°C with some derating required for high power dissipation. Except for catastrophic failures due to extreme conditions of high power dissipation, the circuits survived thermal cycling under bias to 300°C. The surviving circuits functioned again upon cooling with no noticeable degradation. The output current generally degraded at high junction temperatures, but each circuit was found to exhibit anomalous behavior. Above 250°C and at lower current levels, the output voltage exceeded the nominal output voltage by up to 300%. (LEW)

32458 (UCRL—15426-Vol.1) **Calibration characteristics of IRAD GAGE vibrating wire stressmeter at normal and high temperature. Volume 1.** Dutta, P.K.; Hatfield, R.W.; Runstadler, P.W. Jr. (Creare Products, Inc., Lebanon, NH (USA)). Oct 1981. Contract W-7405-ENG-48. 117p. NTIS, PC A06/MF A01. Order Number DE82005512.

This report describes calibration studies of the IRAD GAGE Vibrating Wire Stressmeter. The work has been performed for the University of California, Lawrence Livermore Laboratory, to understand and interpret the behavior and performance of the stressmeter in Climax granite. To help interpret the results obtained in Climax granite, the study also included calibration tests of the gage in other materials: Barre granite, aluminum, and Lucite. Stressmeter calibrations were carried out in thin rock slabs by determining the relation between the stressmeter readings and uniaxial plane stresses. Calibrations were also conducted under biaxial and triaxial stress fields.

32459 (UCRL—15426-Vol.2) **Calibration characteristics of IRAD GAGE vibrating wire stressmeter at normal and high temperature. Volume 2.** Dutta, P.K.; Hatfield, R.W.; Runstadler, P.W. Jr. (Creare Products, Inc., Lebanon, NH (USA)). Oct 1981. Contract W-7405-ENG-48. 91p. NTIS, PC A05/MF A01. Order Number DE82006862.

Raw data for the calibration study tests for the IRAD GAGE vibrating wire stressmeter are presented.

32460 **Optoelectronic display units - status and trends.** Teodorescu, D. *Messen + Pruefen;* No. 5, 301-306(May 1981). (In German).

Optoelectronic display units are getting increasing attention. This is not surprising as the success of an electronic instrument often depends on its display characteristics. Functioning and uses of some of the most recent display units are analyzed in order to illustrate the development towards high brightness, optimum angle of view, energy consumption, service life, etc.

32461 **Temperature-profile detector.** (to Dept. of Energy). US Patent Application 229,496. 29 Jan 1981. 11p. Contract AC06-76RL01830.

Temperature profiles at elevated temperature conditions are monitored by use of an elongated device having two conductors spaced by the minimum distance required to normally maintain an open circuit between them. The melting point of one conductor is selected at the elevated temperature being detected, while the melting point of the other is higher. As the preselected temperature is reached, liquid metal will flow between the conductors creating short circuits which are detectable as to location.

32462 **Liquid-level-sensing device.** (to Dept. of Energy). US Patent Application 229,424. 29 Jan 1981. 10p. Contract AC06-76RL01830.

A liquid level sensing device is described which comprises load cell supporting a column or stack of segments freely resting on one another. The density of each element is substantially identical to that of the surrounding liquid. The elements are freely guided within a surrounding tube. As each element is exposed above the liquid level, its weight will be impressed through the column to the load cell, thereby providing a signal at the load cell directly proportional to the liquid level elevation.

32463 **High-temperature-measuring device.** (to Dept. of Energy). US Patent Application 229,497. 27 Jan 1981. 11p. Contract AC06-76RL01830.

A temperature measuring device for very high design temperatures (to 2000°C) is described. The device comprises a homogenous base structure preferably in the form of a sphere or cylinder. The base structure contains a large number of individual walled cells. The base structure has a decreasing coefficient of elasticity within the temperature range being monitored. A predetermined quantity of inert gas is confined within each cell. The cells are dimensionally stable at the normal working temperature of the device. Increases in gaseous pressure within the cells will permanently deform the cell walls at temperatures within the high temperature range to be measured. Such deformation can be correlated to temperature by calibrating similarly constructed devices under known time and temperature conditions.

32464 **Measurement of bubble size distributions in fermentation media using a photoelectric probe.** Weiland, P.; Brentrup, L.; Onken, U. *German Chemical Engineering (English Translation);* **3**: No. 5, 296-302(Oct 1980).

Optical methods are not suitable for the measurements of bubble size distributions in the case of fermentation media on account of turbidity of the broth. Therefore a sterilizable photoelectric probe was developed for this particular type of application. In principle, the method consists of sucking a small sample stream from the dispersion through a transparent capillary tube in which the bubbles are transformed into slugs. The length of these slugs is determined by means of two light sensors on the basis of different light absorption in gas and liquid. The experimental results showed that the photoelectric probe is suitable for a fast determination of bubble size distributions under sterile conditions. Therefore the method can be used for process control. It proved particularly successful in reactors with uniform two-phase flow (airlift loop reactors), while in those with non-uniform flow (stirred tank reactors) the method is restricted to low gas throughputs.

32465 **Apparatus for measuring chloride emissions from refuse incineration.** Jockel, W. *Muell und Abfall;* **12**: No. 3, 73-80(1980). (In German).

Several measuring devices to supervise the emissions of gaseous inorganic chlorine compounds for refuse incinerating plants are presented which are based partly on optical, partly on chemical-physical methods. The characteristic parameters are compared. Whereas spectroscopic working devices were advantageous regarding measuring technique and maintenance, the lack of practice and high investment costs are adverse factors. More highly qualified personnel are required to measure chlorine emissions than those of sulphur dioxide and carbon monoxide.

4404 Well Logging Instrumentation

REFER ALSO TO CITATION(S) 31781, 31883, 31884, 31885, 31890, 32456

32466 (SAND—82-0425, pp 41-50) **Magnetic materials and devices for high temperatures.** Schaller, G.E. (Ceramic Magnetics, Inc., Fairfield, NJ). Feb 1982. NTIS, PC A09/MF A01.

From IEEE high temperature electronics and instrumentation conference; Houston, TX, USA (7 Dec 1981).

Magnetic materials for application at ambient temperatures in excess of 200°C are described. The magnetic properties of these

materials are dependent on the composition required to establish maximum upper temperatures. The trade-offs required for high temperature performance on parameters; such as B/sub sat/, permeability, BH loop and Curie temperatures, are reviewed. Complete data on a material for 200°C operation is presented. Several non-standard applications of ferrites with reference to a rotating transformer assembly for slip ring replacement at ambient temperature greater than 300°C, are discussed.

32467 (SAND—82-0425, pp 69-80) **Thick film materials and discrete passive components.** Vest, R.W. (Purdue Univ., W. Lafayette, IN). Feb 1982. NTIS, PC A09/MF A01.

From IEEE high temperature electronics and instrumentation conference; Houston, TX, USA (7 Dec 1981).

The use of commercially available materials and components is discussed, particularly thick films and inks for resistors and capacitors. Also discussed is the status of thick film systems developed specifically for use at high temperatures. Certain thick film inks and add-on components have been shown to retain usable properties to 300°C, and a few materials have been shown to function above 300°C. Complete systems which can guarantee good performance above 300°C are still in the development stage. Resistor inks and low k dielectric ink are reported to produce extremely stable thick film systems with low temperature coefficients that can be used for extended periods at temperatures up to 500°C. Medium k dielectric ink, when properly processed and terminated, is found useful as a capacitor dielectric for extended periods up to 400° C, and to 500° C with reduced performance. (LEW)

32468 (SAND—82-0425, pp 109-116) **300° quad operational amplifier.** Beasom, J.D.; Patterson, R.B. III. (Harris Semiconductor, Melbourne, FL). Feb 1982. NTIS, PC A09/MF A01.

From IEEE high temperature electronics and instrumentation conference; Houston, TX, USA (7 Dec 1981).

The results of a development program whose goal was production of a monolithic quad op amp intended for limited life operation at 300°C are described. The circuit is intended to be used for well logging and similar high temperature applications. High temperature design problems and process choices are described. Circuit design methods and performance of the completed circuit are presented. Reliability concerns and results are considered.

45 EXPLOSIONS AND EXPLOSIVES

4501 Chemical

REFER ALSO TO CITATION(S) 32301

32469 **(UCID—18253) TAAMM submunition project. Monthly progress report No. 8, July 1-31, 1979.** Walker, F.E. (Lawrence Livermore National Lab., CA (USA)). 15 Aug 1979. Contract W-7405-ENG-48. 23p. NTIS, PC A02/MF A01. Order Number DE82006866.

Progress during July 1979 in the development of the TAAMM warhead is reported. The one gun test was unsuccessful due to the velocity augmentor misfiring. Analytical studies were performed to determine velocity augmentor optimization. Hardware for the optimum augmentor is being fabricated. The results of a series of shaped charge tests are reported. Some delay detonators have been obtained and will be tested. (LCL)

4502 Nuclear

REFER ALSO TO CITATION(S) 32574

32470 **(PNL-SA—9630) Heat and blast effects of nuclear detonations on desert biota.** Rickard, W.H. (Pacific Northwest Lab., Richland, WA (USA)). Jun 1981. Contract AC06-76RL01830. 24p. (CONF-8106152—2). NTIS, PC A02/MF A01. Order Number DE82005905.

From American Association for the Advancement of Science annual meeting of the pacific division; Eugene, OR, USA (15 Jun 1981).

The response of Mojave Desert biota to heat and blast effects of nuclear explosives is summarized. (ACR)

32471 **Psychology of the nuclear balance.** Sonntag, P. *Bild der Wissenschaft;* **18**: No. 10, 112-116(Oct 1981). (In German).

The balance of military forces is meant to prevent war. But it is a very precarious balance, which becomes all the more dubious when the deterrent is no longer psychologically effective: when the country attacked is deterred from striking back with nuclear weapons. A unilateral disarmament above the overkill level would be possible without endangering the balance. It would improve the climate for mutual disarmament.

50 ENVIRONMENTAL SCIENCES, ATMOSPHERIC

5001 Basic Studies

REFER ALSO TO CITATION(S) 31901, 32491

32472 **(BNL—30322) Interaction of the atmospheric boundary layer with large-scale processes over the Bay of Bengal during MONEX79.** SethuRaman, S. (Brookhaven National Lab., Upton, NY (USA)). 1981. Contract AC02-76CH00016. 7p. (CONF-8110143—1). NTIS, PC A02/MF A01. Order Number DE82005503.

From International conference on scientific results of the monsoon experiment; Denpasar, Bali, Indonesia (26 Oct 1981).

This paper discusses the role of the atmospheric boundary layer in the Bay of Bengal cyclogenesis processes. The boundary layer experiment at Digha consisted of three main components: (1) a 10 m micrometeorological tower at the beach with instruments to observe turbulent fluxes of heat and momentum over the ocean; (2) a weather station that continuously recorded mean parameters; and (3) pilot balloon observations to a height of about 1000 m.

32473 **(DOE/EV/10610—01) Geochemical and geophysical models of the fossil-fuel CO_2 climate problem. Semiannual progress report, February 2, 1981-August 31, 1981.** Hoffert, M.; Wiscombe, W. (New York Univ., NY (USA). Dept. of Applied Science). 1981. Contract AC02-81EV10610. 26p. NTIS, PC A03/MF A01. Order Number DE82005484.

Efforts were directed towards development of a coupled ocean-atmosphere climate model. An important discovery was made with far-reaching implications for the CO_2 problem: the evaporative constraint on tropical ocean temperature described by Newell and Dopplick (1979), when put into a climate model, yields much more realistic simulations than the current generation of energy-balance climate models have been able to achieve. A summary of the model is presented. (ACR)

32474 **(LA-UR—81-3573) Reduction of photosynthetically active radiation under extreme stratospheric-aerosol loads.** Gerstl, S.A.W.; Zardecki, A. (Los Alamos National Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 24p. (CONF-8110141—1). NTIS, PC A02/MF A01. Order Number DE82006105.

From Conference on large body impacts and terrestrial evolution; Snowbird, UT, USA (18 Oct 1981).

The recently published hypothesis that the Cretaceous-Tertiary extinctions might be caused by an obstruction of sunlight is tested by model calculations. First we compute the total mass of stratospheric aerosols under normal atmospheric conditions for four different (measured) aerosol size distributions and vertical profiles. For comparison, the stratospheric dust masses after four volcanic eruptions are also evaluated. Detailed solar radiative transfer calculations are then performed for artificially increased aerosol amounts until the postulated darkness scenario is obtained. Thus we find that a total stratospheric aerosol mass between 1 and 4 times 10^{16} g is sufficient to reduce photosynthesis to 10^3 of normal. We also infer from this result that the impact of a 0.4- to 3-km-diameter asteroid or a close encounter with a Halley-size comet may deposit that amount of particulates into the stratosphere. The darkness scenario

of Alvarez et al., is thus shown to be a possible extinction mechanism, even with smaller size asteroids or comets than previously estimated.

32475 **(PNL-SA—8705) Dependence of vertical wind shear fluctuations on averaging times.** Doran, J.C. (Pacific Northwest Lab., Richland, WA (USA)). Sep 1980. Contract AC06-76RL01830. 3p. (CONF-810306—8). NTIS, PC A02/MF A01. Order Number DE82006088.

From 5. symposium on turbulence, diffusion, and air pollution; Atlanta, GA, USA (9 Mar 1981).

Some measurements of wind shear fluctuations made in moderate to high wind speed conditions are analyzed. The results are compared with those reported by other investigators. The behavior of wind shear distributions as they are affected by the averaging time for the measurement are examined, with particular attention to the probability of occurrence of extreme events. (ACR)

32476 **Effect of spatial variability of meteorological data on annual average air concentrations predicted by a wind-rose model.** Pendergast, M.M. (Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Lab.). *Atmospheric Environment;* **16**: No. 2, 267-271(1982).

The significance of spatial variability of meteorological data was evaluated using calculated and observed annual average air concentrations. The joint frequency distributions of wind velocity and stability measured at eight locations were used as input to a simple diffusion model recommended by NRC to predict annual average air concentrations at 13 sites surrounding the Savannah River Plant, Aiken, SC,U.S.A. The model caused an overprediction of about a factor of three with a variability of about 50% among the eight locations examined. A comparison of linear correlation coefficients between calculated and observed concentration ranges between 0.73 and 0.96 depending upon tower location. The linear correlation coefficients showed no relationship between either distance from the source release point or the amount of meteorological data used to represent the annual frequency distribution of wind and stability.

32477 **Nocturnal drainage flow over complex terrain using a generalized shallow fluid approximation.** Freeman, B.E.; Bunker, S.S.; Davis, C.G. (Los Alamos National Lab., NM). pp 253-255 of Mountain meteorology. Boston, MA; American Meteorological Society (1981).

From 2. conference on mountain meteorology; Steamboat Springs, CO, USA (9 Nov 1981).

An approximate formulation of the problem of nocturnal drainage flow has been incorporated into a computer code. This formulation, representing a generalization of the shallow fluid approximation, is applicable to complex terrain and accounts for many of the salient physical effects exhibited by drainage flow. These include the dynamics of the katabatic flow, radiation cooling, surface drag, entrainment of the overlying layer, the Coriolis force and interaction with the synoptic flow. Example calculations have been performed in one and two horizontal dimensions. These calculations exhibit a number of interesting qualitative flow features which have been observed, such as thinning of the layer over ridges and pooling in valleys. Researchers also find that hydraulic jumps are present in the flow. The calculation shows qualitatively correct behavior at modest computational cost. Several processes which are represented parametrically can probably be tuned by comparison with data. Also, by virtue of the low cost of calculations, the model can be applied widely with a resulting gain in experience in how to best use the output. Having cited these advantages, however, it must be recognized that the model is markedly limited by its lack of vertical resolution. The more detailed description afforded by the truly three-dimensional model is necessary for a more complete understanding of this vertical structure.

5002 Chemicals Monitoring And Transport

REFER ALSO TO CITATION(S) 31742, 32477, 32569, 32591, 32592

32478 **(ANL/AA—26) Effects of atmospheric deposition of energy-related pollutants on water quality: a review and assessment.** Davis, M.J. (Argonne National Lab., IL (USA)). May 1981. Contract W-31-109-ENG-38. 98p. NTIS, PC A05/MF A01. Order Number DE82007036.

The effects on surface-water quality of atmospheric pollutants that are generated during energy production are reviewed and evaluated. Atmospheric inputs from such sources to the aquatic environment may include trace elements, organic compounds, radionuclides, and acids. Combustion is the largest energy-related source of trace-element emissions to the atmosphere. This report reviews the nature of these emissions from coal-fired power plants and discusses their terrestrial and aquatic effects following deposition. Several simple models for lakes and streams are developed and are applied to assess the potential for adverse effects on surface-water quality of trace-element emissions from coal combustion. The probability of acute impacts on the aquatic environment appears to be low; however, more subtle, chronic effects are possible. The character of acid precipitation is reviewed, with emphasis on aquatic effects, and the nature of existing or potential effects on water quality, aquatic biota, and water supply is considered. The response of the aquatic environment to acid precipitation depends on the type of soils and bedrock in a watershed and the chemical characteristics of the water bodies in question. Methods for identifying regions sensitive to acid inputs are reviewed. The observed impact of acid precipitation ranges from no effects to elimination of fish populations. Coal-fired power plants and various stages of the nuclear fuel cycle release radionuclides to the atmosphere. Radioactive releases to the atmosphere from these sources and the possible aquatic effects of such releases are examined. For the nuclear fuel cycle, the major releases are from reactors and reprocessing. Although aquatic effects of atmospheric releases have not been fully quantified, there seems little reason for concern for man or aquatic biota.

32479 **(BNL—27818) Environmental Chemistry Division annual report.** Newman, L. (Brookhaven National Lab., Upton, NY (USA)). Dec 1979. Contract AC02-76CH00016. 88p. NTIS, PC A05/MF A01. Order Number DE82005695.

The research activities making up the Environmental Chemistry Division Programs of the Department of Energy and Environment are described. Some of the more significant accomplishments during 1979 are described and plans for 1980 are discussed briefly. Publications for the period are listed and abstracts are provided. For each program, the Principal Investigator, research objectives, and funding levels for FY 1979 and FY 1980 are given. The thrust of the Environmental Programs area of Department of Energy and Environment is toward the definition and measurement of energy-related pollutants in the environment, the evaluation of their effects on component ecosystems, particularly in the northeastern United States, and the development and verification of system models that will permit the prediction of the impacts of energy-induced activities on the environment. There are over 50 individual programs, involving studies in the atmospheric, oceanographic, limnological, and terrestrial ecology sciences. These programs are reported under sections for each of the three Divisions and one Group: the Atmospheric Sciences Division, the Environmental Chemistry Division, the Oceanographic Sciences Division, and the Land and Freshwater Environmental Sciences Group.

32480 **(PNL-SA—9311) Global CO_2 buildup and possible climate modification.** Stokes, G.M. (Pacific Northwest Lab., Richland, WA (USA)). Feb 1981. Contract AC06-76RL01830. 6p. (CONF-810505—6). NTIS, PC A02/MF A01. Order Number DE82005981.

From Institute of Environmental Sciences annual meeting; Los Angeles, CA, USA (4 May 1981).

The non-local effects of fossil fuel power production due to the release of trace gases to the atmosphere are likely to be on a global scale. The eventual social and economic impacts of such global effects can be understood only after we have developed a detailed understanding of how the release of these gases influences the natural system. For CO_2, the impacts will likely be large if the resulting climatic changes seriously modify the amount of water contained in continental ice sheets. While there is considerable at-

tention currently focussed on the CO_2 problem, the release of other trace gases, such as CO, may also have global consequences. The key to understanding these global changes and how and when they might occur, may well rest on our ability to characterize the history of the chemical composition of the atmosphere and successfully model those changes.

32481 (UCID—19300) Air-quality-model update. Penner, J.E.; Walton, J.J. (Lawrence Livermore National Lab., CA (USA)). 15 Jan 1982. Contract W-7405-ENG-48. 56p. NTIS, PC A04/MF A01. Order Number DE82007145.

The Livermore Regional Air Quality Model (LIRAQ) has been updated and improved. This report describes the changes that have been made in chemistry, species treatment, and boundary conditions. The results of smog chamber simulations that were used to verify the chemistry as well as simulations of the entire air quality model for two prototype days in the Bay Area are reported. The results for the prototype day simulations are preliminary due to the need for improvement in meteorology fields, but they show the dependence and sensitivity of high hour ozone to changes in selected boundary and initial conditions.

32482 Design and preliminary results of the intermediate density precipitation chemistry experiment. Raynor, G.S. (Brookhaven National Lab., Upton, NY). pp 47-49 of Applications of air pollution meteorology. Boston, MA; American Meteorological Society (1982).

From 3. joint conference on applications of air pollution meteorology; San Antonio, TX, USA (11 Jan 1982).

The Intermediate Density Precipitation-Chemistry Experiment was conducted in April 1981 as one of two concurrent components of the interlaboratory OSCAR (Oxidation and Scavenging Characterization of April Rain) experiment under the MAP3S/RAINE (Multistate Atmospheric Power Production Pollution Study/Regional Acidity of Industrial Emissions) program. The overall objective of the MAP3S/RAINE program is to define the relationships between the emissions of air pollutants, their deposition and the chemical quality of precipitation. The OSCAR study was designed to provide as detailed as possible examination of the dynamical and chemical features of selected frontal storm systems as they passed over the eastern half of the country, to assess the spatial and temporal variability of precipitation chemistry, to provide a data base for model development, to develop increased understanding of wet removal mechanisms and to identify source areas.

32483 Should we trust models or observations. Ellsaesser, H.W. (California Univ., Livermore (USA). Lawrence Livermore National Lab.). *Atmospheric Environment;* **16**: No. 2, 197-205(1982).

From AAAS annual meeting. Session on 'The SST controversy ten years later'; Toronto, Canada (8 Jan 1981).

Scientists and laymen alike already trust observational data more than theories-this is made explicit in all formalizations of the scientific method. It was demonstrated again during the Supersonic Transport (SST) controversy by the continued efforts to reconcile the computed effect of the 1961-62 nuclear test series on the ozone layer with the observational record. Scientists, caught in the focus of the political limelight, sometimes, demonstrated their faith in the primacy of observations by studiously ignoring or dismissing as erroneous data at variance with the prevailing theoretical consensus-thereby stalling the theoretical modifications required to accommodate the observations.

32484 Wind tunnel measurements of the resuspension of ideal particles. Fairchild, C.I.; Tillery, M.L. (Los Alamos Scientific Lab., NM (USA)). *Atmospheric Environment;* **16**: No. 2, 229-238(1982).

Resuspension of spherical particles was studied in a small diameter wind tunnel having a smooth resuspension surface. Resuspension was measured at wind velocities from 5 to 22 ms^{-1} with fully developed turbulent flow in the experimental section of the tunnel. Resuspension rates for 7 μm count median diameter (cmd) particles at 10.5 ms^{-1} wind velocity were increased by factors of 1.33 and 2.3 when 100 and 200 μm saltation spheres, respectively, were injected upstream of the 7 μm spheres. Resuspension rates for 0.8 μm cmd particles at the same wind velocity increased by factors of 2.5 and 6.7 for injection of equal numbers of 100 and 200 μm spheres, respectively. Vertical flux was determined for the above saltation conditions at a wind velocity of 10.4 +- 0.5 ms^{-1}. Saltation by either 100 or 200 μm particles increased the maximum vertical flux of the 7 μm cmd spheres by less than a factor of 2. Vertical flux of the 0.8 μm cmd spheres was increased by one order of magnitude by saltation with 100 μm spheres, and two orders of magnitude by the same number of 200 μm spheres.

32485 Contamination measurements with quadrupole mass spectrometer. Bohatka, S.; Berecz, I.; Langer, G. *Vakuum-Technik;* **30**: No. 7, 208-211(Oct 1981). (In German).

From 8. International Vacuum Congress (IVC-8) and 4. International conference on solid surfaces; Cannes, France (22 - 26 Sep 1980).

A sensitive quadrupole mass spectrometer of our own construction was used for different purity measurements. The analysis of gases in operating rooms showed a 1 ppm-10^5 ppm concentration of narcotics and helped to develop an effective and cheap method for regenerating narcotic filters. We regularly control the gases used in radioactive pollution measurements by internal GM counters and in radiocarbon dating technique. Combustion products and the gases of a fermenter are investigated for industrial application.

32486 Emissions and immissions of environmentally relevant trace elements. Kleinhorst, H. *Zement-Kalk-Gips;* **34**: No. 10, 491-498(Oct 1981). (In German).

With reference to the results of measurements it is shown that the trace elements introduced with the raw material or with the fuel of a firing system are liberated to a considerable extent and may, more particularly with cyclic processes, give rise to high levels of emission of environmentally relevant compounds. The article also reports investigations that should be carried out in the context of licensing procedures and subsequent regulations issued by a public authority. Finally, the author deals with the requirements to be imposed upon a cement works on the basis of the state of the art and the distribution of the emissions.

32487 Application of LAMMA in aerosol research. Wieser, P.; Wurster, R.; Haas, U. *Fresnius' Zeitschrift fuer Analytische Chemie;* **308**: No. 3, 260-269(Sep 1981).

From LAMMA-Symposium; Duesseldorf, Germany, F.R. (8 - 10 Oct 1980).

The preliminary applications of the LAMMA instrument to aerosol research show that this new microprobe can give unexpected insights into the chemical nature of the particle material. The chemical histograms obtained by LAMMA analysis of an individual particle as well as of particle populations are very helpful for both the identification of source specific particle properties as well as for the investigation of the chemical particle alterations in the gasborne and deposited state. This can also lead to a better estimate of particle induced effects which, for example, are important in biology, medicine, meteorology and other related fields.

32488 Biogeochemistry of toxic metals. Schwedt, G. *Umschau in Wissenschaft und Technik;* **81**: No. 15, 450-454(1 Aug 1981). (In German).

For poisonous elements such as arsenic and mercury, natural, biologically and chemically determined cycles between sediments (earth), water and air exist. Inorganic (mineral) substances are converted into organic metal compounds, with which they establish an equilibrium. These equilibria can be disturbed by contaminants, leading to excessive formation of certain compounds. The toxicological evaluation of an ecosystem on the basis of heavy-metal concentrations is often determined by knowledge of the content of various compounds of an element. However, due to the difficulties of trace analysis, our current knowledge is not sufficient.

32489 Nucleation and growth of stratospheric aerosols. Castleman, A.W. Jr. (Univ. of Colorado, Boulder); Keesee, R.G. *Annual Review of Earth and Planetary Sciences;* **9**: 227-249(1981). Contract AC02-78EV04776.

Various sampling studies and numerical models have provided evidence that the in situ oxidation of sulfur-bearing gases is responsible for the sulfate mass of the stratospheric aerosol. These data suggest that there is a common source of sulfur compounds for the stratosphere of both the northern and southern hemispheres. Using elementary modeling calculations and the results of laboratory experiments, researchers have speculated that the stratospheric aerosol layer originates, at least in part, from SO_2 oxidation via OH. Very little is known concerning the origin of the primary small particles that form as a result of processes following the generation of the precursors to the prenucleation embryos. It is almost certain that homogeneous nucleation does not operate in the atmosphere and that the more relevant processes are those termed heteromolecular and heterogeneous nucleation. The relative contribution of the various mechanisms proposed for the introduction of particles in the stratosphere has not been established. Nevertheless, the general characteristics and extent of the stratospheric sulfate aerosol are reasonably well understood in terms of coagulation, condensation, evaporation, and sedimentation when a source for the generation of new particles is assumed.

32490 **Application of factor analysis to urban aerosol source resolution.** Hopke, P.K. (Univ. of Illinois, Urbana). *ACS (American Chemical Society) Symposium Series;* No. 167, 21-49(1981).

Among the multivariate statistical techniques that have been used as source-receptor models, factor analysis is the most widely employed. The basic objective of factor analysis is to allow the variation within a set of data to determine the number of independent causalities, i.e. sources of particles. It also permits the combination of the measured variables into new axes for the system that can be related to specific particle sources. The principles of factor analysis are reviewed and the principal components method is illustrated by the reanalysis of aerosol composition results from Charleston, West Virginia. An alternative approach to factor analysis, Target Transformation Factor Analysis, is introduced and its application to a subset of particle composition data from the Regional Air Pollution Study (RAPS) of St. Louis, Missouri is presented.

32491 **Modeling a multiple tracer release experiment during nocturnal drainage flow in complex terrain.** Lange, R. (Lawrence Livermore National Lab., CA). pp 245-252 of Mountain meteorology. Boston, MA; American Meteorological Society (1981). Contract W-7405-ENG-48.

From 2. conference on mountain meteorology; Steamboat Springs, CO, USA (9 Nov 1981).

In order to better understand the atmospheric effects of energy production on the local and regional scale, the US Department of Energy has established the program of Atmospheric Studies in Complex Terrain. One aspect of this effort is to improve the numerical modeling capabilities for the study of transport and diffusion of aerial pollutants over terrain typical of energy development sites. To provide the data, an initial two week ASCOT field study was conducted in July 1979 in The Geysers geothermal area of California 100 km north of San Francisco to study nocturnal drainage flow in a series of six nighttime experiments. The complex conditions posed by very localized winds and turbulence, rugged topography, variable surface roughness, strong vertical motions and gravity flow require a three-dimensional modeling approach to realistically simulate the dispersal of hydrogen sulfide injected into the atmosphere at The Geysers geothermal area. In this study the three-dimensional particle-in-cell numerical diffusion model ADPIC was used to simulate the transport and diffusion of two simultaneous, distinguishable fluorescent tracer releases into the nighttime drainage flow regimes of the Putah and Anderson Creeks in the Anderson Springs Valley during the night of July 24, 1979. The ADPIC code requires a three-dimensional mean wind field as input. This advection field was provided by the three-dimensional mass-conservative diagnostic MATHEW model in the form of hourly averaged velocity component files. Both models and their inputs will be discussed in connection with the experiment of July 24, and a comparison will be drawn between experimental and computed results.

32492 **Electrochemical apparatus for simultaneously monitoring two gases.** Bruckenstein, S.; Rosek, J.A. US Patent Application 177,978. 14 Aug 1980. 43p.

This invention relates to monitors for quantitatively indicating the presence of gases and more specifically to a novel electrochemical gas monitor for simultaneously determining the concentrations of two different gases in a sample of ambient air.

32493 **Side products and pollutants in combustion processes.** pp 147-157 of Brennstoffe, Kraftstoffe, Schmierstoffe. Singer, E. Hannover, Germany, F.R.; Schroedel (1980). (In German)

The impurities released to the atmosphere from the combustion of fuels and motor fuels are discussed here from the environmental protection viewpoint. The differences between emission (e.g. motor vehicle exhaust gases) and immissions (pollutants released to the environment by chimneys and their atmospheric effects) are given, as well as a few important legal specifications for control and limitation of of the pollutants.

5003 Radioactive Materials Monitoring And Transport

REFER ALSO TO CITATION(S) 31797, 32478, 32485

32494 **Statement of the Strahlenschutzkommission concerning a comparison between population exposures due to radioactive emissions from coal-fired and nuclear power plants.** *Bundesanzeiger;* **33**: No. 150, 1-2(15 Aug 1981). (In German).

It is found that radioactive emissions from both types of power plant amount to 1/10% to 1% of the mean natural population exposure in West Germany at the present state of waste air purification and filtering.

5004 Thermal Effluents Monitoring And Transport

32495 **Mathematische Modellierung fuer die Ausbreitung von Kuehlturmschwaden in der Atmosphaere. (Mathematical modelling of the atmospheric distribution of cooling tower plumes).** Egler, W. Duesseldorf, Germany, F.R.; VDI-Verlag (1981). 148p.

The 3 D model KASTEL is presented which gives a realistic description of the physical processes in cooling tower plumes. Partial differential equations are used as balances of mass, momentum, and energy. The flow field is calculated using the eddy transport equation and Poisson's current function equation. The Reynolds shear stresses and turbulent flows of enthalpy and moisture are described by a complex turbulence model which solves differential equations for turbulence energy, its dissipation rate, and the covariances of enthalpy and moisture.

5000 ENVIRONMENTAL SCIENCES, ATMOSPHERIC

5005 Site Resource And Use Studies

REFER ALSO TO CITATION(S) 31863

5006 Regulations

REFER ALSO TO CITATION(S) 32311

51 ENVIRONMENTAL SCIENCES, TERRESTRIAL

5101 Basic Studies

REFER ALSO TO CITATION(S) 32425

32496 **Ecology.** Remmert, H. Berlin, Germany, F.R.; Springer (1980). 289p.

The second edition of this outstanding textbook is now available in translation to English-speaking readers. Revised and expand-

ed from the first edition, it brings into even greater focus the relationship between ecology and sensory physiology.

5100 ENVIRONMENTAL SCIENCES, TERRESTRIAL

5102 Chemicals Monitoring And Transport

REFER ALSO TO CITATION(S) 32488

32497 **(DP-MS—81-72) Management of soil systems for the disposal of industrial wastes.** Corey, J.C. (Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Lab.). 1981. Contract AC09-76SR00001. 20p. (CONF-811171—1). NTIS, PC A02/MF A01. Order Number DE82004347.

From American Society of Agronomy meeting; Atlanta, GA, USA (29 Nov 1981).

Research continues to provide improved information about the toxicity of materials, their transport in soil, and the kinetics of detoxification that is most useful in evaluating alternative approaches for safely managing industrial wastes. The placement of industrial wastes into soil systems is a satisfactory management approach if the material is nontoxic, if the soil has the capability of detoxifying the material, or if the soil prevents the material from entering the biosphere. Examples from the literature of successful applications of industrial wastes to soil are discussed.

32498 **(PNL-SA—9014) Statistical evaluation of litterfall data from a forest monitoring study.** Skalski, J.R.; McShane, M.C.; Hinds, W.T. (Pacific Northwest Lab., Richland, WA (USA)). Jan 1981. Contract AC06-76RL01830. 11p. (CONF-810436—5). NTIS, PC A02/MF A01. Order Number DE82005883.

From Environmetrics '81 conference; Washington, DC, USA (6 Apr 1981).

Study sites were established in the states of Washington and Oregon to determine the feasibility of using litterfall sampling as a biological monitoring technique. Detection of ecological impacts to forest communities caused by Pacific Northwest energy development was the monitoring goal. The study reported here was designed to evaluate the statistical precision of litterfall sampling and to assess the possibility of detecting both monthly and seasonal changes in litterfall. Four sites were established in closed canopy, mature forest stands and litterfall was monitored to relate characteristics of predominant forest communities in the Pacific Northwest to the observed sampling precision.

32499 **Situation and analysis of residues in milk.** Heeschen, W.; Bluethgen, A.; Tolle, A. pp 33-40 of Kongressband 1979. Stand und Leistung agrikulturchemischer und agrarbiologischer Forschung. Frankfurt am Main, Germany, F.R.; J.D. Sauerlaender (1980). (In German)

From 91. VDLUFA congress; Giessen, Germany, F.R. (17 - 22 Sep 1979).

The analysis of extensive data on the Federal Republic of Germany shows that the maximum values set in 1974 for chlorinated hydrocarbons were only met by more than 50% and that, with the exception of α and β UHT milk, residues in 1978 were always less than 10% of the maximum permissible amounts. ADI residues per l of milk amounted to 0.16% γ-HCH or Lindane, 0.45% heptachloroexpoxide, 1.3% cheldrin, 0.26% DDT, and 1.9% hexachlorobenzene. The HCH problem is directly connected with the application of HCH-containing substances on the skin of lactating animals. Toxic heavy metals, e.g. lead or cadmium, are a problem for milk production only in the near vicinity of emitters and on soils with high lead concentrations. In this case, however, it is the animal that is endangered rather than the consumer. Antobiotics are found in crude and processed milk only in very few cases. Also mycotoxins do not present a problem in milk and milk products if animal food regulations are observed (mean value < 10 ng/l). In spite of these rather favourable findings, research on toxic elements in milk will continue to be of utmost importance.

32500 **Exposure to heavy metals from foods.** Kaeferstein, F.K. pp 316-321 of Kongressband 1979. Stand und Leistung agrikulturchemischer und agrarbiologischer Forschung. Frankfurt am Main, Germany, F.R.; J.D. Sauerlaender (1980). (In German)

From 91. VDLUFA congress; Giessen, Germany, F.R. (17 - 22 Sep 1979).

The present communication deals only with the metals lead, cadmium, and mercury. Foods - including drinking water - are of considerable importance for the load of heavy metals in man. Tobacco smoke is also of importance. At its 22nd Session in April 1978, the FAO/WHO Expert Committee on Food Additives has confirmed the maximal intake values for Pb and Hg adopted in 1972, it did not express, however, its views on Cd. In the Federal Health Office, toxicological evaluation of Pb, Cd, and Hg levels in foods has been based on the WHO values. To assess the intake of Pb, Cd, and Hg through food, the Centre for Health Evaluation and Surveillance of Environmental Chemicals (ZEBS) of the Federal Health Office has used the composite method, taking into account consumption and heavy metal contents of foods. A data bank has been established with ZEBS to store data on the contents of foreign substances in foods. Despite qualitative and quantitative shortcomings of the data on heavy metal contents maintained at the ZEBS data bank, we considered it possible and necessary to calculate, as a first model, the load for the average adult. It was found that even if assuming unfavourable conditions, the resulting values at present account for about 40% of the WHO values in the case of Pb, 70% in the case of Cd, and 35% in the case of Hg. The actual load is expected to be still lower; of course, also higher loads are probable, in particular for certain population groups (persons consuming large amounts of e.g. fish, edible fungi, edible offals).

32501 **Relation between the location and the heavy metal contents of vegetables.** Venter, F. pp 336-342 of Kongressband 1979. Stand und Leistung agrikulturchemischer und agrarbiologischer Forschung. Frankfurt am Main, Germany, F.R.; J.D. Sauerlaender (1980). (In German)

From 91. VDLUFA congress; Giessen, Germany, F.R. (17 - 22 Sep 1979).

Analyses for heavy metal contents of three vegetable species and the respective soil samples from different growing areas showed differences dependent on location. Relatively low heavy metal contents in the soil did not clearly affect heavy metal contents in the plants. Pot experiments carried out with vegetables did not show any significant increase of EDTA soluble heavy metals in soils by treatment of sandy and loam soils with graded amounts (up to 5% of weight) of an 'ausgefaulten' sewage sludge. Vegetable plants, too, had partly significantly higher heavy metal contents, showing thereby clear differences between vegetable species. Treatment with sewage sludge cannot be recommended for vegetable production.

32502 **Influence of technological steps on the heavy metal contamination in foodstuffs.** Bielig, H.J.; Hofsommer, H.J. pp 353-364 of Kongressband 1979. Stand und Leistung agrikulturchemischer und agrarbiologischer Forschung. Frankfurt am Main, Germany, F.R.; J.D. Sauerlaender (1980). (In German)

From 91. VDLUFA congress; Giessen, Germany, F.R. (17 - 22 Sep 1979).

The heavy metal content of foodstuffs is influenced by technological steps during manufacturing. The unit operations washing, blanching, crushing, separating and mixing, preservation, packing and storage and their decontamination effects are discussed, dealing with several fields of food technology. In many cases, those processes result in lower contents of metal compounds. Washing and its parameters is discussed in detail, because this process is one of the most effective. As an example for processing from harvest to storage apple juice production is described to show the different influences on heavy metal content. Contamination with lead and tin as a result of canning is discussed. In this case the important parameters are pH, composition of the ingredients, storage time and temperature and last not least type and quality of the canning material. Technological possibilities for more effective decontamination as well as limiting factors are discussed.

32503 **Heavy metal contents of leaf vegetables in relation to increasing amounts of garbage sewage sludge composts applied in pot experiments.** Foroughi, M.; Venter, F.; Teicher, K. pp 426-437 of Kongressband 1979. Stand und Leistung agrikulturchemischer und agrarbiologischer Forschung. Frankfurt am Main, Germany, F.R.; J.D. Sauerlaender (1980). (In German)

From 91. VDLUFA congress; Giessen, Germany, F.R. (17 - 22 Sep 1979).

Increasing amounts of garbage sewage sludge compost were mixed to three different types of soil (sand, loam, bog). These soil mixtures were analysed for their contents of EDTA soluble heavy metals, as well as for their total contents of heavy metals. Test plants used for these pot experiments were spinach, head lettuce, and corn salad. Heavy metal contents in the test plants were measured after harvesting. The results show: pH values, particularly of bog soils, but also of both of the other soils increased along with increasing amounts of garbage sewage sludge composts applied to the substrate. Higher treatment with garbage sewage sludge composts produced higher contents of EDTA soluble Cu and Pb in all of the test soils. The contents of EDTA soluble Cd, Cr and Ni insignificantly increased in sandy and loamy soils only. EDTA soluble Mn remained almost unchanged. Higher Zn and Cu supply in the soil produced also higher Zn and Cu contents in the plants. Mn contents in plant substance decreased with increasing amounts of garbage sewage sludge applied to the soil. There was almost no influence of increased Cd, Cr and Ni treatment in sandy and loamy soils on the Cd, Cr and Ni contents of the leaf vegetables tested. Despite of the relatively high amounts of undesired EDTA soluble heavy metals, particularly Pb and Ni, in garbage sewage sludge composts, the heavy metal contents in leaf vegetables remained almost unchanged. The highest deviations in Pb contents were found in spinach.

5103 Radioactive Materials Monitoring And Transport

REFER ALSO TO CITATION(S) 31795, 31797, 31805, 31816, 31817, 32200, 32535

32504 **(ARL/TR—037) Natural radioactivity in the production of titanium dioxide pigment: a study of the Laporte Plant and environment behaviour of radionuclides at Bunbury, Western Australia.** Cooper, M.B.; Statham, J.R.; Williams, G.A. (Australian Radiation Lab., Melbourne). Oct 1981. 31p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE82700282.

A study of radioactivity levels in samples collected at a titanium dioxide plant at Bunbury in Western Australia is described. The radioactivities of the principal radionuclides present in the ilmenite feed (^{226}Ra, ^{228}Ra, and ^{228}Th) are followed throughout the pigment production process. It is found that approximately 67 MBq/day of activity due to each of ^{228}Ra and ^{228}Th enters the plant (equivalent to 17.8 kg of thorium), and approximately 14 MBq/day of activity due to ^{228}Ra. Essentially all of this radioactivity leaves the plant in the form of acidic effluent, which is pumped to disposal lagoons and allowed to neutralise and drain away. A preliminary study of possible environmental effects of radioactivity in the effluent is presented. It was established that in the presence of high sulphate ion concentrations in both the plant feed liquor and the effluent, thorium remains in solution whereas radium, which forms an insoluble sulphate compound, tends to coprecipitate and is found in solid residues throughout the process.

32505 **(CONF-8110125—1) Administrative practices to limit dose in environmental cleanup operations involving plutonium.** Barker, C.J.; Crites, T.R.; Hornbacher, D.D. (Rockwell International Corp., Golden, CO (USA). Rocky Flats Plant). 1981. Contract AC04-76DP03533. 8p. NTIS, PC A02/MF A01. Order Number DE82004208.

From International symposium on the application of the dose limitation system in nuclear fuel cycle facilities and other radiation practices; Madrid, Spain (22 Oct 1981).

Administrative policies and practices that contribute to controlling doses to operating personnel and to the public during general operation of the Rocky Flats Plant and during specific cleanup operations are discussed. Mechanisms for establishing responsibility and implementing appropriate controls to protect the environment were described for a typical DOE contractor operation. The manner in which these controls are applied to an operation dealing with the removal of plutonium contamination from the environment is detailed, and a description of the techniques applied and the lessons learned is given.

32506 (INIS-mf—6902, pp v) **Tritium uptake by plants.** Koenig, L.A. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Hauptabteilung Sicherheit). Jan 1980. (In German). Dep. NTIS (US Sales Only).

In Status report on radionuclide transfer.

After an introductory general view at the radio ecology of tritium, tests made within an IAEA programme are briefly reported on which deal with the behaviour of tritium in the environment and the uptake by plants under several climate conditions. In Finland, tests were carried out with peas, needle leaves of pines and spruces, leaves of binches, whortleberries and bilberries, and grass, in France at vines, orange and olive trees. Other tests done in other countries are mentioned only briefly. No answer was found to the question of how tritium is incorporated in organic compounds in the food chain. The author is of the opinion that, even if the tritium uptake by plants is understood better, this would not really improve the calculations of the radiation exposition of man by tritium.

32507 (INIS-mf—6902, pp v) **Status report - transfer of C-14 from air to humans.** Wirth, E. (Bundesgesundheitsamt, Neuherberg (Germany, F.R.). Inst. fuer Strahlenhygiene). Jan 1980. (In German). Dep. NTIS (US Sales Only).

In Status report on radionuclide transfer.

To calculate the radiation exposition of man by carbon-14, the specific activity model can be used. Using this, the C-14 concentration in the human body can be calculated very exactly. The main exposition takes place via the ingestion. Exact investigations show that during the incorporation of the anorganic carbon into the food chain, in the photosynthesis, the heavy isotope C-14 is depleted dosn to about 5% as compared with C-12. This rate of discrimination against air remains almost the same up to man thus the radiation exposition being a little overestimated by the specific activity model. An increased radiation exposition caused by increased CO_2-level in the air shows its complete effects on men after months and years due to the growth times of plants and animals and the long remaining times of the carbon bound in the human tissue. For the calculation of the radiation exposition in the surroundings of a nuclear power plant only the carbon emitted as $^{14}CO_2$ is important. CO_2 can be assimilated by plants only in light and in the warmer seasons. Therefore, the meteorological conditions of the summer season should be applied when calculating the radiation exposition. It is found as a consequence of the validity of the specific activity model that it is not correct to incorporate the food quantitiy linearly into a calculation of radiation exposition caused by C-14.

32508 (INIS-mf—6902, pp v) **Transfer of Sr and Cs into vegetation through the roots.** Biesold, H. (Gesellschaft fuer Reaktorsicherheit m.b.H. (GRS), Koeln (Germany, F.R.). Abt. Strahlenschutz). Jan 1980. (In German). Dep. NTIS (US Sales Only).

In Status report on radionuclide transfer.

The results obtained worldwide in experiments on the radionuclides Sr 90 and Cs 137 concerning their behaviour in the biosphere give good bases for estimating the transfer from the ground into the plants. As there are nearly no data available on the transfer of Cs 137 and Sr 90 in agricultural products on grounds of the Federal Republic of Germany, experiments with typical sorts of soil used in agriculture should be carried out at flower pots, greenhouses and fields. The knowledge obtained internationally should be taken into consideration when carrying out the tests and selecting the ground samples.

32509 (INIS-mf—6902, pp v) **Iodine transfer from the ground into plants.** Schuettelkopf, H. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Hauptabteilung Sicherheit). Jan 1980. (In German). Dep. NTIS (US Sales Only).

In Status report on radionuclide transfer.

The author regards the deposition of radioiodine from the air as the most important way of contamination from plants. Investigations carried out near to the WAK show that the deposition of I-129 from the air can in no case be described with the deposition speed of I_2. It is assumed that the inactive CH_3I plays a key role in the complicated mechanism of the reduction of the deposition speed of radio iodine. Due to the complicated analytics, only few samples could be taken by the author in the surroundings. Here, a definite explanation of the effects of CH_3I on the deposition of radioiodine should be given.

32510 (INIS-mf—6902, pp v) **I129 in the biocycle.** Handl, J.; Kuehn, W. (Gesellschaft fuer Strahlen- und Umweltforschung m.b.H. Muenchen, Hannover (Germany, F.R.)). Jan 1980. (In German). Dep. NTIS (US Sales Only).

In Status report on radionuclide transfer.

A brief survey on the few known data on the radioecological behaviour of ^{129}I is given. Numerous investigations as to the ^{129}I-uptake in the thyroid of cattle were carried out in the USA. In Western Europe, practically only in the near surroundings of nuclear-technical plants measurements of ^{129}I were carried out. In the author's opinion, to clarify the ecological behaviour of ^{129}I, human thyroids should be examined as well, in special regions the share of ^{129}I in milk, grass, food, and ground-near air should be determined and tests with especially important iodine compounds from various soils and plants should be carried out concerning this re-emissions.

32511 (INIS-mf—6902, pp v) **Tc enrichment in plants through the roots.** Biesold, H.; Heim, K. (Gesellschaft fuer Reaktorsicherheit m.b.H. (GRS), Koeln (Germany, F.R.). Abt. Strahlenschutz). Jan 1980. (In German). Dep. NTIS (US Sales Only).

In Status report on radionuclide transfer.

The first tests on the transfer of Tc were carried out in 1974 with several useful plants and soils in the form of pot tests. The transfer factors obtained therefrom are listed. Other experiments with natural soils and other technetium compounds - up to now, only TcO_4 was dealt with - are, according to the author, necessary, as well as large-pot or field experiments.

32512 (INIS-mf—6902, pp v) **Transfer of plutonium, americium, and curium from ground to vegetation through plant roots.** Pimpl, M.; Schuettelkopf, H. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Hauptabteilung Sicherheit). Jan 1980. (In German). Dep. NTIS (US Sales Only).

In Status report on radionuclide transfer.

The transfer factors told show that only very little quantities of the plutonium, americium, and curium in the ground can be taken up by the plants, americium being better available than plutonium by the factor 100. The few data documenting the uptake of curium by plants indicate that the uptake of this nuclide by plants is only little more than that of plutonium. Other experiments concerning the influence of the sort of ground, the dependence of the actinide uptake on the or of the ground contamination and the time of exposition are necessary, in the author's opinion. As for americium and curium, there are too little data available which means that a large spectrum of experiments seems important. It is recommended for other experiments, to use useful plants serving as food bases in the Federal Republic of Germany.

32513 (INIS-mf—6902, pp v) **Supplement to the paper 'Transfer of plutonium, americium, and curium from ground to vegetation through plant roots'.** Frindik, O. (Bundesforschungsanstalt fuer Ernaehrung, Karlsruhe (Germany, F.R.). Zentrallaboratorium fuer Isotopentechnik). Jan 1980. (In German). Dep. NTIS (US Sales Only).

In Status report on radionuclide transfer.

32514 (INIS-mf—6902, pp v) **Transfer of the corrosion nuclides ^{59}Fe, ^{54}Mn, ^{65}Zn, and ^{60}Co from ground to vegetation.** Fuehr, F. (Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.). Arbeitsgruppe Radioagronomie). Jan 1980. (In German). Dep. NTIS (US Sales Only).

In Status report on radionuclide transfer.

As the heavy metals Fe, Mn, Zn, and Co are released from nuclear power plants and reprocessing plants through the waste air or waste water, it is important to know their radioecological behaviour. A survey of availability and behaviour of these heavy metals in the ground and in the plants is given. As further goals for other experiments the author mentions the question of the vegetation time-dependent uptake by agricultural and horticultural plants and the tolerance of the ground towards these elements in connection with sewage sludge or garbage sludge composts.

32515 (INIS-mf—6902, pp v) **Ground/plant transfer factors of Ra-226, Po-210, and Pb-210.** Schuettelkopf, H. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Hauptabteilung Sicherheit). Jan 1980. (In German). Dep. NTIS (US Sales Only).

In Status report on radionuclide transfer.

32516 (INIS-mf—6902, pp v) **Requirements for a practical assessment of transfer and concentration factors in plants.** Fuehr, F. (Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.). Arbeitsgruppe Radioagronomie); Hoffmann, G. (Staatliche Landwirtschaftliche Untersuchungs- und Forschungsanstalt Augustenberg, Karlsruhe (Germany, F.R.)). Jan 1980. (In German). Dep. NTIS (US Sales Only).

In Status report on radionuclide transfer.

This article represents an attempt to compile the representative conditions for uptake tests for the determination of transfer factors, basing on the present level of knowledge. This is expected to be both a help for the evaluation of the numerous data in literature and a support in the setting up of new representative tests.

32517 (INIS-mf—6902, pp v) **Guidelines for sampling of soils and vegetation in order to determine contamination, radiation burden in the vicinity of nuclear power plants, seepage, and transfer factors of radionuclides.** Hoffmann, G. (Staatliche Landwirtschaftliche Untersuchungs- und Forschungsanstalt Augustenberg, Karlsruhe (Germany, F.R.)). Jan 1980. (In German). Dep. NTIS (US Sales Only).

In Status report on radionuclide transfer.

By proceeding in a standardized way when sampling and examining the soils for the purposes named in the title of the guiding lines, the examination and analysis data obtained at several locations should be comparable with each other to the highest possible degree. The recommendations are made taking into consideration other recommendations made by other gremia for the same or for similar projects and general problems of sampling. They establish the minimal requirements which ensure comparisons with the results in the international literature.

32518 (INIS-mf—6902, pp v) **Transfer from vegetation to milk.** Wiechen, A. (Bundesanstalt fuer Milchforschung, Kiel (Germany, F.R.). Inst. fuer Chemie; Bundesanstalt fuer Milchforschung, Kiel (Germany, F.R.). Inst. fuer Physik). Jan 1980. (In German). Dep. NTIS (US Sales Only).

In Status report on radionuclide transfer.

The transfer of ^{3}H, ^{14}C, Sr-, I- and Cs isotopes and of ^{99}Tc from food into milk is reported on. The transfer factors found in several experiments and in different soils are listed.

32519 (INIS-mf—6902, pp v) **Transfer from vegetation to meat.** Schelenz, R. (Bundesforschungsanstalt fuer Ernaehrung, Karlsruhe (Germany, F.R.). Zentrallaboratorium fuer isotopentechnik). Jan 1980. (In German). Dep. NTIS (US Sales Only).

In Status report on radionuclide transfer.

The article contains a list of the transfer factors food/meat for Sr and Cs which have been referred to in several articles without dealing closely with the individual data. The author proposes to deal intensively with the literature in order to achieve more knowledge on the transfer factors food/meat for Sr and Cs and for other relevant radionuclides, especially the corrosion nuclides ^{59}Fe, ^{54}Mn, ^{65}Zn and ^{60}Co.

32520 (INIS-mf—6902, pp v) **Characteristics and accuracy of calculation models.** Schmid-Albrecht, M.; Huber, O. (Bundesgesundheitsamt, Neuherberg (Germany, F.R.). Inst. fuer Strahlenhygiene). Jan 1980. (In German). Dep. NTIS (US Sales Only).

In Status report on radionuclide transfer.

When using deterministic models in radioecology the question of the reliability of the estimated values they produce and the question of the correspondence between the reliability and the purpose of application became less important. In the author's opinion, these questions should be answered urgently. The nuclide-specific and the nuclide-nonspecific parameters must be tested as to their preconditions of validity, their reliability and their changeability after determining them by experiments.

32521 (PUC-tn—02/80) **Two decades of research in the Brazilian areas of high natural radioactivity.** Cullen, T.L.; Paschoa, A.S.; Franca, E.P.; Costa-Ribeiro, C.; Barcinski, M.; Eisenbud, M. (Pontificia Univ. Catolica do Rio de Janeiro (Brazil). Inst. de Fisica). Jan 1980. 7p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700281.

A review is made of the most important findings obtained in the decades 1960-1980 in the Brazilian regions of high natural radioactivity. The research was carried out by three university groups: Pontificia Universidade Catolica do Rio de Janeiro, Universidade Federal do Rio de Janeiro and New York Universisity.

32522 **Reactor-released radionuclides in Susquehanna River sediments.** Olsen, C.R.; Larsen, I.L.; Cutshall, N.H. (Oak Ridge National Lab., TN (USA)); Donoghue, J.F. (Smithsonian Institution, Washington, DC (USA)); Bricker, O.P. (Geological Survey, Baltimore, MD (USA)); Simpson, H.J. (Columbia Univ., Palisades, NY (USA). Lamont-Doherty Geological Observatory; Columbia Univ., Palisades, NY (USA). Dept. of Geological Sciences). *Nature (London);* **294**: No. 5838, 242-245(19 Nov 1981).

Release data of ^{137}Cs, ^{134}Cs, ^{60}Co and ^{58}Co in the liquid effluent from Three Mile Island and Peach Bottom reactor sites are considered together with measured concentrations of the same nuclides found in sediments of the Susquehanna River and the upper portions of Chesapeake Bay within a few months of the TMI accident. From the reported distributions of reactor-released radionuclides and their extent of environmental contamination in the Susquehanna-Upper Chesapeake Bay System it is shown that there was no evidence for nuclides characteristic of a ruptured fuel element though nuclides characteristic of routine operations were present.

32523 **Radionuclide transport and retardation in tuff.** Vine, E.N.; Bayhurst, B.P.; Daniels, W.R.; DeVilliers, S.J.; Erdal, B.R.; Lawrence, F.O.; Wolfsberg, K. (Los Alamos Scientific Lab., NM). pp 483-490 of Scientific basis for nuclear waste management. Volume 3. Moore, J.G. (ed.). New York, NY; Plenum Publishing Corporation (1981).

Data from crushed tuff columns indicate that, except in simple cases where sorption coefficients are relatively low, and ion-exchange equilibria not only exist but are the dominant mechanism for removal of radioisotopes from solution, the simple relation between the sorption ratio R/sub d/ (or K/sub d/) and the relative velocity of radionuclides with respect to groundwater velocity may be insufficient to permit accurate modeling of the retardation of radionuclides. Additional work on whole core columns and larger blocks of intact material is required to better understand radionuclide sorption and transport through rock.

5104 Thermal Effluents Monitoring And Transport

REFER ALSO TO CITATION(S) 31808, 32470

5105 Site Resource And Use Studies

REFER ALSO TO CITATION(S) 31729, 31863

32524 (NP—2903328) **Illinois synthetic-fuels facilities-siting survey. Document No. 81/36.** (Illinois Dept. of Energy and Natural Resources, Chicago (USA); Environmental Science and Engineering, Inc., St. Louis, MO (USA)). Nov 1981. 65p. State of Illinois-Dept. of Energy and Natural Resources, Div. of Environmental Management, 309 W. Washington St., Chicago, IL 60606.

Portions of document are illegible.

The environmental siting study reported here was conducted with the goal of identifying potential locations for the construction and operation of a coal gasification or synthetic fuels facilities. It is intended that the information obtained during the siting study be utilized by the state of Illinois in directing or guiding energy-related development and to assist and attract potential developers. Site screening was based on potential impacts and facility requirements; areas were evaluated in the following disciplines: water availability and quality; air quality; ecological aspects; geotechnical concerns; socioeconomic impacts; coal availability; and transportation. Because available abundant coal supply was identified as a major requirement of a site, only the southern half of the state, that part having readily available coal reserves, was evaluated. The study involved regional screening of the southern half of the state to determine areas favorable, potentially favorable, potentially favorable with conditions or restricted for siting purposes, for all disciplines. Discipline determinations were composited and the most restrictive discipline determination was applied to each area of the screening region.

5100 ENVIRONMENTAL SCIENCES, TERRESTRIAL

5106 Regulations

REFER ALSO TO CITATION(S) 32080

52 ENVIRONMENTAL SCIENCES, AQUATIC

5201 Basic Studies

REFER ALSO TO CITATION(S) 32496

32525 **Mathematical modelling - a management tool for aquatic ecosystems.** Fedra, K. *Helgolaender Wissenschaftliche Meeresuntersuchungen;* **34**: No. 2, 221-235(1980).

Mathematical modelling may serve as a rational and powerful tool in the management of complex ecosystems. However, ecosystem models are drastic simplifications of the real world. As a rule they are based on a rather incomplete and scattered knowledge of the system in question. Furthermore, ecological systems and in particular marine systems are characterised by a high degree of complexity, spatial and functional heterogeneity, nonlinearity, complex behavioural features such as adaptation and self-organisation, and a considerable stochastic element. Nevertheless, if management is to be based on predictions from mathematical models - and it has to be based on some kind of 'model' in at least a broad sense - we need an estimate of prediction accuracy in terms of the management variables and constraints. One possible approach to model uncertainty is a probabilistic interpretation of model predictions, generated by use of Monte-Carlo techniques. Fuzzy data sets and ranges are used. The resulting model response allows the derivation of measures for model credibility. Probability distributions can be computed for certain system states under (un)certain input conditions, representing the effects of insufficient data and structural uncertainty on model-based predictions. Such analysis indicates that prediction uncertainty increases, not only with the uncertainty in the data, but also with increasing 'distance' from the empirical conditions, and with time. Present ecosystem models can be a tool for qualitative discrimination between different management alterna-

tives, rather than a credible means for detailed quantitative predictions of system response to a wide range of input conditions.

5200 ENVIRONMENTAL SCIENCES, AQUATIC

5202 Chemicals Monitoring And Transport

REFER ALSO TO CITATION(S) 32478, 32488

32526 **(NUREG/CR—2220-Vol.1) Impact of entrainment and impingement on fish populations in the Hudson River estuary. Volume I. Entrainment-impact estimates for six fish populations inhabiting the Hudson River estuary.** Boreman, J.; Barnthouse, L.W.; Vaughn, D.S.; Goodyear, C.P.; Christensen, S.W.; Kumar, K.D.; Kirk, B.L.; Van Winkle, W. (Oak Ridge National Lab., TN (USA)). Jan 1982. Contract W-7405-ENG-26. 420p. (ORNL/NUREG/TM—385/VI). NTIS, PC A18/MF A01. Order Number DE82006952.

This volume is concerned with the estimation of the direct (or annual) entrainment impact of power plants on populations of striped bass, white perch, Alosa spp. (blueback herring and alewife), American shad, Atlantic tomcod, and bay anchovy in the Hudson River estuary. Entrainment impact results from the killing of fish eggs, larvae, and young juveniles that are contained in the cooling water cycled through a power plant. An Empirical Transport Model (ETM) is presented as the means of estimating a conditional entrainment mortality rate (defined as the fraction of a year class which would be killed due to entrainment in the absence of any other source of mortality). Most of this volume is concerned with the estimation of several parameters required by the ETM: physical input parameters (e.g., power-plant withdrawal flow rates); the longitudinal distribution of ichthyoplankton in time and space; the duration of susceptibility of the vulnerable organisms; the W-factors, which express the ratios of densities of organisms in power plant intakes to densities of organisms in the river; and the entrainment mortality factors (f-factors), which express the probability that an organism will be killed if it is entrained. Once these values are obtained, the ETM is used to estimate entrainment impact for both historical and projected conditions.

32527 **(ORNL/TM—7628) Design of fluidized-bed, biological denitrification systems.** Patton, B.D.; Hancher, C.W.; Pitt, W.W.; Walker, J.F. (Oak Ridge National Lab., TN (USA)). Jan 1982. Contract W-7405-ENG-26. 29p. NTIS, PC A03/MF A01. Order Number DE82007131.

Many commercial processes yield nitrate-containing wastewaters that are being discharged to the environment because traditional recovery or disposal methods are economically unacceptable. The anticipated discharge limits (i.e., 10 to 20 g $(NO_3^-)/m^3$) being considered by many states will not allow continued release of these wastewaters. The new discharge standards can be met economically by use of the fluidizied-bed, biological denitrification process. Research and development studies were conducted with 0.05-, 0.10-, 0.20-, and 0.50-m-diam fluidized-bed bioreactor systems. Feed nitrate concentrations were in the 0 to 10,000 g $(NO_3^-)/m^3$ range. Using the data from these studies, rate expressions were developed for the destruction of nitrate as a function of nitrate concentration. Methods were also developed for sizing bioreactors and biomass control systems. The sizing methods for fluidized-bed denitrification systems are described, and support systems such as sampling and analysis, instrumentation and controls, utilities, and bacteria storage are discussed. Operation of the process is also briefly discussed to aid the designer. Using the methods presented in this report, fluidized-bed, biological denitrification systems can be designed to treat nitrate wastewater streams.

32528 **(ORNL/TM—7788) Aqueous chemistry of chlorine: chemistry, analysis, and environmental fate of reactive oxidant species.** Jolley, R.L.; Carpenter, J.H. (Oak Ridge National Lab., TN (USA)). Jan 1982. Contract W-7405-ENG-26. 123p. NTIS, PC A06/MF A01. Order Number DE82007501.

This report reviews (1) the chemistry of chlorine relative to its reactions in fresh, estuarine, and marine waters and the formation of reactive oxidant species; (2) the current status of chemical analysis of reactive chlorine species and chlorine-produced oxidant species relative to analysis of low concentrations (microgram-per-liter range) and determination of accuracy and precision of methods; and (3) the environmental fate of chlorine and chlorine-produced oxidant species.

32529 **Sediments as criteria for water quality.** Mueller, G. *Umschau in Wissenschaft und Technik;* **81**: No. 15, 455-458(1 Aug 1981). (In German).

The extent, distribution and provenance of heavy metal contamination in rivers, lakes and marginal seas can be determined by sediment investigations. The heavy metal contamination of the sediments of the Neckar River and its major tributaries was mapped applying the 'index of geoaccumulation', a measure which compares present heavy metal concentrations with precivilizational background values.

32530 **Comparison of several methods for collection and quantification of polycyclic aromatic hydrocarbons from aqueous media.** Caton, J.E.; Barnes, Z.K.; Kubota, H.; Griest, W.H.; Maskarinec, M.P. (Oak Ridge National Lab., TN). pp 329-344 of Advances in the identification & analysis of organic pollutants in water. Volume 1. Keith, L.H. (ed.). Ann Arbor, MI; Ann Arbor Science Publishers, Inc. (1981). Contract W-7405-ENG-26.

The general analytical methodology for the analyses of aqueous samples for polycyclic aromatic hydrocarbons (PAH) may be divided into three areas: isolation of the components of interest from the bulk of the aqueous media; concentration of the isolated sample into the appropriate solvent; and determination of the PAH of interest in the concentrated sample. Of these general areas more analytical problems arise from the isolation step. Thus, this present study has emphasized the comparison of several different isolation methods. Methods for isolation of PAH from water have been quite varied; but some of the generally employed techniques include solvent extraction and collection on Tenax, XAD resins, polyurethane, carbon or C_{18} reverse-phase liquid chromatography (RPLC) media. The comparative advantages and disadvantages of these techniques will not be reviewed here; however, it should be noted that the general attribute of a good PAH isolation procedure should be to deliver a maximal PAH recovery with a minimal amount of sample manipulation. With this criterion as one of the guidelines for evaluating the efficacy of the isolation step, methods were examined for the isolation of PAH from water involving liquid-liquid extraction (LLE), polystyrene sorbent resins and silica which had been chemically modified for reverse-phase liquid chromatography separations.

32531 **Effects of pollution and the need for long-term monitoring.** Pearce, J.B. *Helgolaender Wissenschaftliche Meeresuntersuchungen;* **34**: No. 2, 207-220(1980).

The general deterioration of coastal water quality and physical despoilation of habitats along the eastern United States coastline has had a major impact on estuarine and coastal fisheries. To understand the full extent of these effects, and to provide data on the rate at which they are spreading geographically, a new monitoring program called Ocean Pulse has been implemented. Ambient levels of contaminants in waters and sediments of the coastal zone are documented, and biological effects are monitored in habitats over the continental shelf as far seaward as high levels of contaminants can be measured. Samples and experimental measurements are taken at contaminated and uncontaminated sites between the Canadian boundary and Cape Hatteras. The primary aim of the Ocean Pulse program is to use changes in physiological/biochemical responses as indicators of biological change due to contaminant loading. Physiological, behavioral, ecological and other responses are measured so as to relate, ultimately, change in community structure, population responses and pathology to variation in the quality of habitat.

32532 **Benthic biological conditions of Los Angeles-Long Beach Harbors.** Reish, D.J.; Soule, D.F.; Soule, J.D. *Helgolaender Wissenschaftliche Meeresuntersuchungen;* **34**: No. 2, 193-205(1980).

Los Angeles-Long Beach Harbors were a grossly polluted body of water at the time of the initiation of benthic biological studies in 1951. Industrial, domestic and storm wastes were emptied into these waters with little or no treatment. The inner harbor waters contained little or no dissolved oxygen and much of the benthos was azoic or possessed a stressed community. However, the outer harbor water mass contained adequate dissolved oxygen, and the benthos supported a rich fauna dominated by many species of polychaetes. A pollution abatement program was initiated in 1968, and today many former wastes have been eliminated or are being diverted to treatment plants for processing. The benthic fauna changed markedly and rapidly following this environmental clean-up. Peaks in population were reached throughout the harbor in 1973-1974 which was followed by a slight decline then stability. An oil tanker explosion, pre-treatment of fish-cannery wastes then diversion of these wastes to a sewage treatment plant, and a change from primary to secondary treatment of sewage brought about changes in the benthic fauna. In the latter instance, benthic populations of polychaetes, fish populations and the number of birds feeding within the area decreased significantly.

5203 Radioactive Materials Monitoring And Transport

REFER ALSO TO CITATION(S) 31797, 31802, 31807, 31816, 32478, 32522, 32523

32533 (INIS-mf—6902, pp v) **Problem of the validity of a specific activity model for tritium.** Wirth, E. (Gesellschaft fuer Strahlen- und Umweltforschung m.b.H. Muenchen, Neuherberg (Germany, F.R.). Inst. fuer Strahlenschutz). Jan 1980. (In German). Dep. NTIS (US Sales Only).

In Status report on radionuclide transfer.

A summary of the outcomes taking into consideration that two thirds of the hydrogen in the human body are in the form of water and one third in form of organic compounds, shows that more than half of it comes from the ground water. As for the rest, ca. two thirds come from the ground water and one third from the air humidity. The explanations show that it is possible to estimate the radiation exposition of man by tritium with the help of a specific activity model for chronic contamination of the environment with HTO. To do this, the specific tritium activities of the ground and surface water and of the air humidity must be determined, corresponding to their contributions to the water household of the human body, for example using the outcomes obtained. Despite all doubts in the outcomes, the radiation exposition by tritium should be estimated realistically. For a conservative calculation of radiation exposition, the specific activity of the source contaminated most can be used.

32534 **(RHO-SA—216) Radionuclide ground-water monitoring program for the separations area, Hanford Site, Washington State.** Graham, M.J. (Rockwell International Corp., Richland, WA (USA). Rockwell Hanford Operations). Oct 1981. Contract AC06-77RL01030. 24p. (CONF-8105118—2). NTIS, PC A02/MF A01. Order Number DE82005749.

From 1. groundwater monitoring symposium; Columbus, OH, USA (29 May 1981).

Rockwell Hanford Operations (Rockwell) is a prime contractor for waste management to DOE at Hanford. The Separations Area, located near the center of the Hanford Site, contains the major radioactive waste storage and liquid waste disposal facilities. As part of the waste management effort, a comprehensive groundwater monitoring network is established for the Separations Area. Under this monitoring program, water samples are collected at various time intervals from more than 100 wells located near liquid-waste disposal facilities. These samples are analyzed for radionuclide and chemical contamination. The purpose of this article is to present an overview of the hydrogeology and the radionuclide ground-water monitoring program of the Separations Area at Hanford. The monitoring program has the following objectives: to assess the performance of the low-level liquid-waste disposal facilities; to determine the impact of liquid-waste discharge on the quality and flow of ground water; and to provide data for input to ground-water flow and transport predictive models.

32535 **Solubility limits of importance to leaching.** Ogard, A.; Bentley, G.; Bryant, E.; Duffy, C.; Grisham, J.; Norris, E.; Orth, C.; Thomas, K. (Los Alamos Scientific Lab., NM). pp 331-337 of Scientific basis for nuclear waste management. Moore, J.G. (ed.). New York, NY; Plenum Publishing Corporation (1981).

The solubilities of some radionuclides, especially rare earths and actinides, may be an important and controlling factor in leaching of waste forms. These solubilities should be measured accurately as a function of pH and not as a part of a multicomponent system. Individual solubilities should be measured as a function of temperature to determine if a kinetic effect is being observed in the data. A negative temperature coefficient of solubility for actinides and rare earths in water would have important consequences for nuclear reactor safety and for the management of nuclear wastes.

5200 ENVIRONMENTAL SCIENCES, AQUATIC

5205 Site Resource And Use Studies

REFER ALSO TO CITATION(S) 32524

5206 Regulations

REFER ALSO TO CITATION(S) 32080, 32096

53 ENVIRONMENTAL-SOCIAL ASPECTS OF ENERGY TECHNOLOGIES

5301 Social And Economic Studies

REFER ALSO TO CITATION(S) 32569

32536 **Assessing health and environmental effects of a developing fuel technology.** Gray, R.H.; Drucker, H. (Pacific Northwest Lab., Richland, WA). pp 499-507 of Beyond the energy crisis: opportunity and challenge. Fazzolare, R.A.; Smith, C.B. (eds.). New York, NY; Pergamon Press (1981). Contract AC06-76RL01830.

Increasing energy demands, coupled with rising prices and an unstable world oil market, have stimulated international interest in developing alternative sources of fuel. Because of vast national coal reserves, the US Department of Energy is currently evaluating development of several coal liquefaction processes. Direct liquefaction processes hydrogenate pulverized coal under high temperature and pressure to produce gaseous, liquid or solid products. Although these processes are promising options for producing fuel, potential health and environmental effects from exposure to coal liquefaction products, process streams or wastes must be carefully assessed. Reseachers describe an integrated approach which couples engineering development with health and environmental assessment to aid design of environmentally acceptable coal liquefaction processes. The research is organized in four phases which correlate with and provide information early in process development.

5300 ENVIRONMENTAL-SOCIAL ASPECTS OF ENERGY TECHNOLOGIES

5302 Assessment Of Energy Technologies

REFER ALSO TO CITATION(S) 31753

32537 **(IAE—3144) Foundation of the technique for assessment of radiation consequences of nuclear power plant accidents.** Pavlenko, V.I.; Antonov, S.N. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Atomnoj Ehnergii). 1979. 44p. (In Russian). NTIS (US Sales Only), PC A03/MF A01. Order Number DE81700787.

The method of analysis of radiation consequences of nuclear power plant accidents with water-water reactors is suggested. Five main classes of accidents are singled out. In the course of the analysis the radiation consequences of important accidents safety for personnel being inside the premises or at the territory of a nuclear power plant should be considered as well as for the population localized outside the plant environment. The calculation of surface contamination of the premises and atmosphere by radioactive iodine due to loss of coolant during NPP normal operation is given. The calculations of accident consequences are considered when the fuel element failure takes place, accidents with a break of pipe lines of primary circuit and leakage, accidents accompanied by partial core melting.

32538 **Technology assessment. Pt. 2.** Grasselt, K.H. *ETZ, Elektrotechnische Zeitschrift, Ausgabe A;* **102**: No. 14, 765-767(Jul 1981). (In German).

The report shows that ecology and economy must come together, and that there is no 'all or nothing' solution. Economic power must not be reduced; a structural change will help to solve raw materials supply and environmental problems. For example, raw materials can be saved by using electronic instead of mechanical systems wherever possible. Economic development is not directly connected with growth. In an open society, the state, the industry, and the scientific sector must cooperate, e.g. in giving young people advice on the carreer to choose as wrong decisions in this field will impair society in the long run.

32539 **Risk analysis and acceptance by the public of large power stations.** Schueller, G.I. *VGB Kraftwerkstechnik;* **60**: No. 10, 805-813(Oct 1980). (In German).

Social progress requires the development of new technological systems and plants. In this respect there is nothing more important than the further development of large power stations in the nuclear field. Since the systems are becoming more and more complicated and, as experience shows, since faults cannot be totally excluded, the community is displaying increasing distrust in the further development of these installations. This distrust could be reduced by means of risk comparisons, namely the comparison of risks arising from these installations with risks regarded as inevitable in everyday life.

55 BIOMEDICAL SCIENCES, BASIC STUDIES

5501 Behavioral Biology

REFER ALSO TO CITATION(S) 32570

32540 **(BNL—30551) Assessment of regional glucose metabolism in aging brain and dementia with positron-emission tomography.** Reivich, M.; Alavi, A.; Ferris, S.; Christman, D.; Fowler, J.; MacGregor, R.; Farkas, T.; Greenberg, J.; Dann, R.; Wolf, A. (Brookhaven National Lab., Upton, NY (USA); Pennsylvania Univ., Philadelphia (USA)). 1981. Contract AC02-76CH00016. 20p. (CONF-8110144—1). NTIS, PC A02/MF A01. Order Number DE82005511.

From Symposium on aging brain and regot alkaloids; Rome, Italy (28 Oct 1981).

This paper explores the alterations in regional glucose metabolism that occur in elderly subjects and those with senile dementia compared to normal young volunteers. Results showed a tendency for the frontal regions to have a lower metabolic rate in patients with dementia although this did not reach the level of significance when compared to the elderly control subjects. The changes in glucose metabolism were symmetrical in both the left and right hemispheres. There was a lack of correlation between the mean cortical metabolic rates for glucose and the global mental function in the patients with senile dementia. This is at variance with most of the regional cerebral blood flow data that has been collected. This may be partly related to the use of substrates other than glucose by the brain in elderly and demented subjects. (PSB)

5502 Biochemistry

REFER ALSO TO CITATION(S) 31848, 32424, 32464, 32549, 32565, 32590

32541 **(DOE/EV/04962—3) Nucleic acid-protein interactions: conformational studies. Progress report, September 1, 1978-August 31, 1981.** Fasman, G.D. (Brandeis Univ., Waltham, MA (USA)). Sep 1981. Contract AS02-78EV04962. 8p. NTIS, PC A02/MF A01. Order Number DE82007506.

High molecular weight chicken erythrocyte chromatin was found not to spontaneously self assemble into native like material after dissociation into 2 M NaCl and reassociation by gradient dialysis. H1/H5 on 200 base pair (bp) mononucleosomes was found to stabilize the linker DNA, as well as core DNA associated with core histones. Mononucleosomes with varying DNA length and H1/H5 content were studied and it was found that H1/H5 stabilizes 30 bp of core DNA. Histone complexes (H3:H4, H2A:H2B and core octamer) were shown to be reversibly renatured after acid denaturation. Solvent and temperature induced conformational transitions of the histone complexes showed that the H3:H4 tetramer was the most flexible complex. Physical-chemical studies on chromatin indicated substantial stabilization of core particle DNA and linker DNA by H1/H5 binding. The difference in conformation of H3:H4 complexes isolated in low and high salt concentrations was shown by serological and circular dichroism analysis. The antibody also reacts with chromatin. A more condensed chromatin was found in HeLa cells where the histones were highly acetylated by butyrate treatment. The effect of acetylation was moderated through the interaction of H1 and HMG proteins. Synthetic chromatins, Poly $(dAdT)_2$ or Poly$(dGdC)_2$: core histone complexes were shown to have a large degree of conformational flexibility of the polynucleotide, indicating weak binding.

5503 Cytology

32542 **Differentiated state of normal and malignant cells or how to define a normal cell in culture.** Bissell, M.J. (Lawrence Berkeley Lab., CA). *International Review of Cytology;* **70**: 27-100(1981). Contract W-7405-ENG-48.

Described are cytological techniques to differentiate malignant and normal cells in culture. Emphasis is placed upon cell function and gene expression for determinative procedures. (DLS)

32543 **Antibody coated gold particles containing radioactive gold in the demonstration of cell surface molecules.** Kent, S.P.; Allen, F.B. *Histochemistry;* **72**: No. 1, 83-90(1981).

Gold particles of varying size which contain either ^{195}Au or ^{199}Au were prepared using white phosphorus or sodium citrate as the reducing agent. After coating with specific antibody to blood group A antigen or human IgG, these particles were used to determine the number of particles binding to the surface of A_1 RBC's or rat RBC's to which human IgG had been attached. The number of particles binding to the surface of cells correlated with the number of antibody coated gold particles in the fluid bathing the cells as well as the number of antigen molecules on the cell surface. That is, the number of particles binding increased as the particle density of the suspension increased and as the cell surface antigen density increased. Under the conditions of the experiments, both blood group A antigen and human IgG appeared to be randomly distributed over the surface of the cells in TEM and SEM preparations.

This approach permitted the quantitation of the number of gold particles bound per cell and at the same time, the examination of the distribution of the particles over the surface of the same cell population by TEM and SEM.

5504 Genetics

32544 Regional gene mapping of human chromosomes purified by flow sorting. Carrano, A.V.; Lebo, R.V.; Yu, L.C.; Kan, Y.W. pp 156-159 of Haematology and blood transfusion. Volume 26. Modern trends in human leukemia IV. Berlin, Germany; Springer-Verlag (1981).

Analysis and sorting of chromosomes using fluorescence-based high speed flow systems has been carried out since 1975. The results of these investigations indicate that the use of these systems for chromosome analysis and sorting is an important adjunct to existing cytogenetic techniques and a primary resource for molecular cytogenetic studies of individual chromosomes. This brief report describes one application of this approach, namely, regional gene mapping of human chromosomes.

32545 Transformation of Haemophilus influenzae by recombinant molecules. Setlow, J.K.; McCarthy, D.R.; Clayton, N.L. (Brookhaven National Lab., Upton, NY). pp 83-91 of Recombinant DNA. Walton, A.G. (ed.). Amsterdam, Netherlands; Elsevier Scientific Publishing Co. (1981).

From 3. Cleveland symposium on macromolecules; Cleveland, OH, USA (22 June 1981).

A gene library of Haemophilus influenzae DNA has been constructed by ligating chromosomal DNA from cells resistant to a number of antibiotics, together with DNA of the H. influenzae plasmid RSF0885. Before ligation both DNAs were cut with the enzyme PvuII. The ligated DNA was allowed to enter competent H. influenzae sensitive to the antibioics and selection was made for resistance to ampicillin, conferred by the plasmid RSF0885 DNA. Two types of Rec-dependent recombination take place between the incoming hybrid plasmid and the chromosome. The most frequent type involves replacement of a section of the chromosome with the homologous portion of the plasmid, the plasmid is usually lost and thus the transformant is ampicillin sensitive. Less frequently the chromosome can also transfer genetic information to the plasmid of a cell being transformed to ampicillin resistance, as shown by restriction and genetic analysis of purified plasmids from transformants. Both types of recombination occur when a plasmid enters the competent cell, rather than after the plasmid has become established.

5505 Metabolism

REFER ALSO TO CITATION(S) 32540

32546 DNA turnover in nonproliferation tissues. Zipfel, P.F.; Kasche, V.; Zoellner, R.; Amneus, H.; Naeslund, L. *Radiation and Environmental Biophysics;* **19**: No. 4, 306(Sep 1981).

5506 Medicine

REFER ALSO TO CITATION(S) 32229, 32231, 32571

32547 (PB—82-121955) Radioimmunoassay data processing (RIAPROG) - 4th edition. Software. (National Inst. of Child Health and Human Development, Bethesda, MD (USA)). 1980. vp, mag tapep. Source tape is in EBCDIC character set. Tapes can be prepared in most standard 7 or 9 track recording modes for one-half inch tape. Identify recording mode desired by specifying character set, track, density, and parity. Call NTIS Computer Products if you have questions. Price includes documentation, PB82-121963.

RIAPROG is a program for weighted least squares linear regression using a logit-log model for analysis of RIA results. It analyzes the error structure of the data to provide the user with an estimate of the error in the response variable at any position on the curve (needed to obtain proper weighting and to predict the % error at any point on the curve). The program also performs the following functions: (1) provides the weighted least squares linear regression analysis of logit(B/Bo) versus LOGe(X); (2) provides graphical display of the dose response curve, the observations, and the 95% confidence limits for a single observation around the line in three coordinate systems (logit(Y) vs log(X), Y = B/Bo vs X); (3) provides a graphical display of the percentage of error for an unknown vs position on the dose response curve; (4) provides dose interpolation for the unknowns, including corrections for variable sample volumes and/or recoveries; (5) provides a plot of the consecutive unknowns; (6) constructs and plots a Scathard plot; (7) based on the 'parallel line' potency, estimates of several curves have been analyzed in the same assay; and (8) provides calculations to optimize conditions for the next RIA assuming that the affinity constant, specific activity, reaction volume, and counting time remain the same...Software Description: The program is written in the Fortran IV-H programming language for implementation on an IBM-370 computer. The computer memory requirement is approximately 300K.

32548 (PB—82-121971) Radioimmunoassay data processing (BASRIA). Software. (National Inst. of Child Health and Human Development, Bethesda, MD (USA)). 1980. vp, mag tapep. Source tape is in EBCDIC character set. Tapes can be prepared in most standard 7 or 9 track recording modes for one-half inch tape. Identify recording mode desired by specifying character set, track, density, and parity. Call NTIS Computer Products if you have questions. Price includes documentation, PB82-121989.

BASRIA contains 14 programs written in the BASIC programming language. This language is well suited to radioimmunoassays since it is interactive, does not require special formatting of the input data (decimal points and careful alignment of data columns are not necessary), and it is easily learned by persons with no previous experience with computers. The program is short and compact, and it provides appropriate methods for calculating the potency estimates for replicates which have been analyzed either in the same or at different dose levels. BASRIA provides fewer options than are available in other NIH logic-log and four parameter logistic programs. For instance, there is no analysis of the Scathard plot corresponding to the RIA dose response curve. A true 'parallel line potency estimate' routine is not provided, although potentially this could be built in utilizing essentially the same logic as in the logit-log method, with parameters A and D fixed. Nor are the following features provided in the program but could be incorporated as options by the user: (1) a detailed analysis of variance to compare the within-dose and between-dose variability for the standards curve; (2) a plot of the predicted percent error vs position on the dose response curve; (3) an optimization program for further assays since the Scathard plot analysis is not performed...Software Description: The program is written in the BASIC programming language for implementation on a DEC PDP-11 computer. However, it can be adapted easily for use by a large number of mini and micro computers.

32549 Distribution of cyclic-GMP-dependent protein kinase in various rat tissues and cell lines determined by a sensitive and specific radioimmunoassay. Walter, U. *European Journal of Biochemistry;* **118**: No. 2, 339-346(17 Aug 1981).

Cyclic-GMP-dependent protein kinase purified from bovine lung was radioiodinated by the Bolton-Hunter procedure yielding a specific radioactivity of 2200 Gi/mmol of enzyme. Using a specific precipitating rabbit antiserum to the cyclic-GMP-dependent protein kinase, a sensitive radioimmunoassay was developed which can detect 200 pg (1.33 fmol) of cyclic-GMP-dependent protein kinase. Immunoreactivity like that of cyclic-GMP-dependent protein kinase was detectable in extracts of all rat tissues tested, in extracts of cultured rat brain and heart cells, and in extracts of rat glioma (C6) and neuroblastoma x glioma hybrid cells. In extracts of several tissues and cell lines the presence of cyclic-GMP-dependent protein kinase was also demonstrated by a photoaffinity-labeling procedure using 8-azidoinosine 3',5'-[^{32}P]monophosphate. The results suggest that cyclic-GMP-dependent protein kinase is ubiquitously distributed although its level varies significantly from tissue to tissue and cell type to cell type. The results also support the hypothesis that

cyclic-GMP-dependent protein kinase is involved in mediating some of the intracellular effects of those hormones, neutrotransmitters and drugs which regulate the intracellular level of cyclic GMP.

32550 **Radioimmunoassay of insect juvenile hormones and of their diol derivatives.** Strambi, C.; Strambi, A.; de Reggi, M.L.; Hirn, M.H.; Delaage, M.A. *European Journal of Biochemistry;* **118**: No. 2, 401-406(17 Aug 1981).

We have developed a radioimmunoassay for insect juvenile hormones. The C_{18} hormone (JH I) was first converted into diol by opening the 10,11-epoxy ring. Diol was then succinylated and coupled to human serum albumin to make it immunogenic. High titer antisera were obtained from immunized rabbits. Succinyl juvenile hormone was also coupled to the peptide glycyltyrosine and iodinated so as to form a water-soluble ^{125}I-labelled analogue well recognized by antibodies (60% bound by the 1/2 000 000 dilution of antiserum routinely used in radioimmunoassay). Standards and biological samples were treated with acidic dioxane in order to convert each hormone into its corresponding diol. In this way, the sensitivity threshold of the radioimmunoassay was under 0.015 pmol. All three diols were equally recognized by the antibodies. Hormones JH I, JH II and JH III could be assayed separately as diols after thin-layer chromatography or high-pressure liquid chromatography purification of the biological samples. This method was used to determine physiological levels of juvenile hormones in the haemolymph of several insects at different development stages including embryos and in corpora allata cultures.

32551 **ACTH measurement in the hypophysis after adrenalectomy and adrenal cortex hormone therapy by means of microphotometry and radioimmunoassay method.** Lange, F. *Microscopica Acta;* **84**: No. 4, 329-337(Jul 1981). (In German).

In experiments after adrenalectomy and adrenal cortex hormone therapy the quantity of ACTH was ascertained in the hypophysis of cats by methods of microphotometry and radioimmunoassay. The deviation of increased of decreased amounts was studied in acute as well as in chronic physiological conditions of the cats. The different methods to measure the quantities are equally efficaceous in identifying the physiological conditions.

32552 **Visualization of the liver with sup(99m)Tc-EHDP in thalassemia major.** Valdez, V.A.; Jacobstein, J.G. *Gastrointestinal Radiology;* **6**: No. 2, 175-176(15 May 1981).

A case is reported in which substantial liver uptake of (sup(99m)Tc-hydroxyethylidene diphosphonate sup(99m)Tc-EHDP) was seen on bone scan. The patient, a 25-year-old male with the diagnosis of thalassemia major made at the age of 3 years, had received regular blood transfusions over many years. Clinical and laboratory evidence of hemosiderosis suggests that the presence of large quantities of iron in the liver of this patient may have been responsible for the hepatic uptake of the bone scanning agent.

32553 **Critical assessment of bone scan quantitation (bone to soft tissue ratios) in the diagnosis of metabolic bone disease.** Fogelman, I.; Gordon, D.; Bessent, R.G. *European Journal of Nuclear Medicine;* **6**: No. 3, 93-97(Mar 1981).

Accurate quantitation from the bone scan image of skeletal uptake of radiopharmaceutical would be of value in the assessment of patients with metabolic bone disease. Repeat measurements of bone to soft tissue (B/ST) ratios on the one set of images were made for 103 subjects, a) by the same observer using lumbar vertebra 2 for the area of bone; b) by the same observer using lumbar vertebra 2 then lumbar vertebra 4; c) by two observers both using lumbar vertebra 2. The median difference between repeat measurements by the same observer was well under 1% but the 5-95 percentile range was -13 to +14%. Between the two observers there was a median difference of 10.6% with a 5-95 percentile range of -11 to +44%. We also measured B/ST ratios in 150 control subjects and 139 patients with various metabolic bone disorders. While statistically significant differences for B/ST ratios were found between the osteomalacia, renal osteodystrophy, Paget's groups, and the control population ($P < 0.001$ in all cases), there was appreciable overlap between individual patient results and the control range. It is concluded, therefore, that measurement of B/ST ratios for the individual is of limited value in clinical practice.

32554 **'Sickle-sign' in bone scintigraphy.** Creutzig, H.; Dach, W. *European Journal of Nuclear Medicine;* **6**: No. 3, 99-101(Mar 1981).

A side-effect of an intensive cytotoxic treatment on bone scanning will be reported: the so-called 'sickle sign', a diffuse activity around the calvarium seen only in patients at cytotoxic therapy. The differentiation between this harmless side-effect and abnormalities caused by the cancer could be done in our patients by a vertex view. All patients with skull metastases or meningeal carcinosis and this sign in the frontal and lateral view had an inhomogenous uptake in the vertex view. This view should therefore be added to the standard views in all patients with the sickle sign.

32555 **Functional study with ^{131}I-Rose Bengal in chronic active hepatitis and nonactive cirrhosis using a three-compartment model.** Galli, G.; Troncone, L.; Focacci, C.; Fedeli, G.; Anti, M. *European Journal of Nuclear Medicine;* **6**: No. 3, 103-105(Mar 1981).

The authors, using ^{131}I-Rose Bengal, determined the fractional transfer constants of a three-compartmental model in 30 patients divided into two groups (chronic active hepatitis and nonactive cirrhosis) on a histological basis. Other functional indexes were also taken into consideration. In nonactive cirrhosis, the results show a greater impairment of Rose Bengal transfer from plasma to liver. In chronic active hepatitis K_{23} (fractional transfer coefficient from the second to the third compartment) appears significantly lower than in nonactive cirrhosis. No significant differences have been found for K_{12} and K_{03}. The best differentiation between the two groups (consistent with histological data in 29 of 30 cases) was obtained by grouping K_{21}, retention index (RI) and SGOT in the discriminant function: $L = 4.88K_{21}-0.016RI + 0.0034SGOT$. The ratio K_{12}/K_{21} seems meaningful for diagnostic purposes and in the evaluation of the hepatocellular damage in single cases.

32556 **Use of hormone receptors in scintigraphy of the ovaries.** Kairento, A.L.; Karonen, S.L.; Adlercreutz, H. *European Journal of Nuclear Medicine;* **6**: No. 3, 107-110(Mar 1981).

Based on the mechanism of hormone receptors, luteinizing hormone (LH) labelled with 123-iodine was used as tracer in scintigraphy of rabbit ovaries. The ovaries were visualized in static pictures 6-15 min after injection except in the case where the rabbit was pre-injected with 10 μg of cold LH. 3.1% of the injected activity was found in the ovaries 14 h after injection.

32557 **Evaluation of image processing and presentation methods in thallium-201 myocardial scintigraphy.** Jackson, S.A.; D'Amico, K.; Salisbury, D.M. *European Journal of Nuclear Medicine;* **6**: No. 3, 111-117(Mar 1981).

Using a phantom to simulate the LAO 45° thallium-201 myocardial image with a transmural infarct of variable detectability, thirteen methods of computer image processing are evaluated for a group of eight observers using receiver operating characteristics (ROC curves). Initial results using electrostatic hardcopy images clearly demonstrate that images with three applications of a nine point smoothing routine and 30% background subtraction, displayed with three cycles of the grey scale, produce significantly more accurate interpretation ($P < 0.001$) than the raw data, or any of the other methods used. This method provides an overall increase in the diagnostic sensitivity for the group and does not introduce a false positive bias. Grey scale cycling provides effective contrast enhancement as does a colour scale presentation. Comparing images as processed above with similarly smoothed images presented with a fifteen colour level scale on a TV monitor, the diagnostic sensitivities are not significantly different and this method provides the optimum image evaluation in this study.

32558 **Nature of technetium compounds. Pt. 1.** Noronha, O.P.D.; Venkateswarlu, K.S. *European Journal of Nuclear Medicine;* **6**: No. 3, 121-129(Mar 1981).

Eleven different sup(99m)Tc compounds having some relevance in clinical nuclear medicine have been classified according to their localizing properties. The following classes of sup(99m)Tc compounds have been compared in a semiquantitative manner, using a Wistar strain rat model: liver and hepatobiliary agents such

as Tc-phytate, Tc-sulfur colloid, reduced (SnII) TcO^-_4, and sup(99m)Tc-LIDA (dimethyl-IDA); bone agents like Tc-pyrophosphate, Tc-HEDP, Tc-EDTMP; kidney and bladder agents comprising Tc-DTPA, Tc-glucoheptonate, Tc-citrate, and TcO^-_4. The in vivo pharmacokinetic behavior lends itself to a unified approach with respect to the nature of sup(99m)Tc compounds. Most of the sup(99m)Tc complexes display an excretory type of pathway. These compounds were found to be relatively stable in aqueous solutions at room temperature (25°-28°C) for at least 2 h without any additives. Both paper chromatographic and biologic (tissue distribution) criteria, commonly used for quality assurance and control of sup(99m)Tc compounds, were employed to study these compounds.

32559 **Carcinoma in hyperfunctioning thyroid nodule in recurrent hyperthyroidism.** Hoving, J.; Piers, D.A.; Vermey, A.; Oosterhuis, J.W. *European Journal of Nuclear Medicine;* 6: No. 3, 131-132(Mar 1981).

A patient with an invasive thyroid carcinoma located within a hot thyroid nodule is reported. Only four similar cases have been described in the literature. It is emphasized that a hot thyroid nodule per se should not be used as an argument against the diagnosis of thyroid carcinoma.

32560 **Quantity control procedures for sup(99m)Ic complexes.** Hesslewood, S.R. *Nuclear-Medizin (Stuttgart);* 20: No. 1, 3-6(Feb 1981).

From 18. international meeting of the Gesellschaft fuer Nuklearmedizin e.V.: Nuclear medicine and interdisciplinary aspects; Nuernberg, Germany, F.R. (9 - 12 Sep 1980).

32561 **Determination of endogenous labelling of thyroid hormones during a radioiodide test in euthyroid goiter patients and hyperthyroid patients.** Loos, U.; Konrad, F.; Ishihara, A.; Adam, W.E.; Pfeiffer, E.F. *Nuclear-Medizin (Stuttgart);* 20: No. 1, 13-18(Feb 1981). (In German).

The administration of a diagnostic dose of radioiodide, as in the radioiodide uptake test, results in the formation and secretion of radioactive thyroid hormones (endogenous labelling). In this report a method is described by which thyroid hormones are chromatographically isolated from serum, with the simultaneous assessment of the incorporated radioactivity over a period of time. A low-level counter was used to measure the small amounts of activity present. By this method the hormone phases during a radioiodide uptake test may be better evaluated. The present results show a good diagnostic discrimination between euthyroidism and borderline or definite hyperthyroidism (by a factor of 10 and 40, respectively). The influence of factors such as a small intrathyroidal iodide pool need, of course, to be considered. Hence, by taking into account such parameters as the intrathyroidal iodide pool, the hormone clearance etc, a technique for the measurement of thyroid hormone secretion can be developed.

32562 **Arterial contribution to total liver perfusion.** Creutzig, H.; Schober, O.; Broelsch, C.; Pichlmayr, R.; Hundeshagen. *Nuclear-Medizin (Stuttgart);* 20: No. 1, 25-29(Feb 1981). (In German).

Dynamic hepatic scintangiography is a method of estimating some aspects of liver hemodynamics. Especially in cirrhotics and in liver-grafted patients this method may be clinically useful. We studied some methodological aspects of the differentiation between the arterial and the portal positions of the liver timeactivity curve. In 16 patients with otherwise proven pure arterial perfusion of the liver there were three different forms of the curve: in 8 cases the first peak was followed by a second upslope. In 5 cases there was a plateau after the peak, and in 3 cases the peak was followed by a downslope of the curve. No general description of all curves could be found. Therefore all methods using plateau techniques for subtracting the arterial from the portal portion of the curve seem to be doubtful. In these and in other patients five different techniques were compared: the arterial part was much underestimated by the method of George (76 +- 9%), slightly underestimated by the method of Biersack (91 +- 8%), and much overestimated by the method of Boyd (123 +- 11%). The methods of Fajman and our modification estimated always 100% in the patients with pure arterial perfusion. Comparing a set of independent evaluations the mean deviation was 11% in normals and 23% in cirrhotics of arterial part. Only rough changes of the arterial to portal ratio of hepatic perfusion can be evaluated by dynamic hepatic scintangiography.

32563 **Detection of abscesses and lymphosarcoma with ^{111}In-deferoxamine mesylate.** Dormehl, I.C.; Jordaan, J.H.; Maree, M.; Goosen, D.J.; Laage, N.J. *Nuclear-Medizin (Stuttgart);* 20: No. 1, 30-34(Feb 1981).

Indium-111-deferoxamine was used to delineate induced abscesses of different ages in a baboon, and lymphnodes in a case of canine spontaneous lymphosarcoma, by means of gamma-scintigraphy. Positive results were obtained already 1 hr after administration of the scanning agent, and the lesion-to-background ratio improved progressively with time. The tissue distribution of the radiopharmaceutical was determined in rats, and showed a relatively high isotope retention in the kidneys.

32564 **Distribution in rats after intravenous injection of ^{88}Y compounds.** Kutzner, J.; Mittas, M.; Grimm, W. *Nuclear-Medizin (Stuttgart);* 20: No. 1, 35-39(Feb 1981). (In German).

^{88}Y was given to rats in the form of citrate, diphosphonate or chloride to determine its accumulation in various organs. The activity in the bones was high but not as high as that of calcium. The application of methylen-diphosphonate showed high enrichment in the liver because of intravital colloid formation. Elimination by the kidneys depends on the type of the ^{88}Y compound applied.

5507 Microbiology

REFER ALSO TO CITATION(S) 31829, 32545

32565 **T4 head assembly and high temperature.** Wever, G.H.; Thompson, B.J.; Laiken, R.M.; Ruby, E.; Wiberg, J.S. (Univ. of Rochester, NY). pp 167-192 of Bacteriophage assembly. New York, NY; Alan R. Liss, Inc. (1981).

Relatively little is known of T4 development above 37°; this virus is usually grown between 30° and 37°, except where heat- or cold-sensitive mutants are used. Yet, its host can be cultured at temperatures close to 49°, and given a suitable growth medium, will support T4 phage production up to almost 46°. Yanagida and Steven have described and characterized the lattice parameters of high temperature tubes, probably tailless giants, made at very low frequencies in wild-type infections above 43°. However, head-length regulation is affected to an even greater extent at 44.8°, since we find that considerable numbers of elongated head forms accumulate in wild-type infections. These aberrant head forms are made at even greater frequencies in infections by regA mutants. Using optical diffraction techniques, we have identified head forms as giant preheads and coarse polyheads. To determine whether the synthesis of head-related proteins is altered in both wild-type and regA infections at 44.8°, reseachers have examined radioactively-labelled cells by SDS-polyacrylamide gel electrophoresis; preliminary results are described in this paper.

5508 Morphology

32566 **Radiographic techniques for investigating cereal grains.** Winkler, M.A. (Los Alamos National Lab., NM). *Cereal Foods World;* 26: No. 10, 581-583(Oct 1981).

Radiographic examination of cereal grain can determine nondestructively the presence of internal structural damage and other defects, which can be correlated to associated problems such as disease and infestation. Radiographs of several representative grains demonstrate the capabilities of the radiographic technique to detect structural deviations in the grains.

5509 Pathology

REFER ALSO TO CITATION(S) 32585

5510 Physiological Systems

REFER ALSO TO CITATION(S) 32588

32567 **Weak binding gases as modulators of hemoglobin function.** Schoenborn, B.P.; Saxena, A.; North, B.E. (Brookhaven National Lab., Upton, NY). pp 305-312 of Molecular basis of mutant hemoglobin dysfunction. New York, NY; Elsevier North Holland, Inc. (1981).

This paper reviews the phenomena of anesthesia caused by weakly binding gases such as xenon and methylene chloride (DCM). Specifically, studies showing the specific binding of inert gases to hemoglobins are presented. The effect of DCM on the oxygenation curve of hemoglobin and on the P50 of human hemoglobin are shown. The use of these inhalation anesthetics as possible antisickling agents is discussed. (KRM)

32568 **Chronopharmacology of L-DOPA: implications for orthochronal therapy in the prevention of circadian dyschronism.** Ehret, C.F.; Meinert, J.C.; Groh, K.R. (Argonne National Lab., IL). pp 47-65 of Chronopharmacology and chronotherapeutics. Walker, C.A.; Soliman, K.F.A.; Winget, C.M. Tallahassee, FL; Florida A & M Univ. Foundation (1981).

The influence of the circadian phase time-of-administration of L-dihydroxyphenylalanine (L-DOPA) upon the circadian rhythm of whole animals, as judged by measures of core temperature, was studied in 36 male rats. Programmed feeding and watering protocols were entirely automated. Core temperatures were continuously monitored by implant telemetry and were statistically analyzed to permit accurate determination of select circadian variables (time of acrophase, period length, phase shift, and degree of dyschronism) during free run. Following a minimum of 10 days entrainment (DL 16:8, FS 8:16), animals were placed in free run (DD FF) during which time they were given a diet containing 30 mg L-DOPA per g chow either preceding or following the ongoing thermal acrophase. If L-DOPA was given preceding the acrophase, then the same animal received the control (DOPA-free) diet during the 12-hr time interval that food was available after the thermal acrophase and vice versa. The experiments showed a strong correlation between circadian dyschronism and the consumption of L-DOPA prior to the acrophase. On the other hand, animals fed L-DOPA either after the acrophase or ad libitum showed little or no dyschronism. In another series, we tested the animals abilities to respond to food-induced phase shifts of 90°, 180°, and 270° and found that orthochronal administration of L-DOPA permits a more rapid and complete phase shift than heterochronal administration. In some instances, however, when heterochronal administration did not result in circadian dyschronism, the animal had phase shifted his circadian rhythm to achieve a harmonious relationship between the application of the chronobiotically active L-DOPA and the phase of the oscillation.

5520 Public Health

REFER ALSO TO CITATION(S) 32536, 32590

32569 **Multivariate methods for assessing disease/environment association: conceptual versus geographic regions.** Carnes, B.A.; Ginevan, M.E.; Collins, J.J. (Argonne National Lab., IL). *EPA (Environmental Protection Agency) Journal;* 212-213(1981). Contract W-31-109-ENG-38.

Geographic variation in mortality levels has been documented for states, cities, state economic areas, and counties. Important factors implicated by these studies include socioeconomic status, urban-rural residence, marital status, industry type, class of worker, race, and environmental pollution. The effects of these mortality correlates, especially air pollution, have been assessed via multiple regression methodology. A major emphasis of these studies has been the selection of a national equation to describe the influence of air pollution on mortality while controlling for other factors. Although national equations greatly simplify inference, the reasonableness of such equations for mortality analysis has not been fully substantiated. Regional differences in factors influencing mortality have been considered in regression models by including dummy coded variables for census regions in the regression model. Accounting for regional differences in this manner assumes census regions do reflect geographic differences, census regions represent well defined, homogeneous collections of counties, and the underlying true census region equations differ only in intercept. If these assumptions are not met, a national equation with average slope estimates can represent a distortion of such magnitude as to render the national equation meaningless. This paper outlines a strategy for evaluating the validity of these assumptions, a methodology for taking corrective steps if necessary, and an illustrative example.

32570 **Human birth weight patterns as an indicator of populations subject to environmental stress.** Cuniss, J.R.B.; Ginevan, M.E.; Brown, C.D. (Argonne National Lab., IL). *EPA (Environmental Protection Agency) Journal;* 222-223(1981). Contract W-31-109-ENG-38.

The present study was undertaken to address two questions of central importance to the possibility of using birth weight as a monitor of the health status of populations. First, can one discern consistent effects of known influencing factors while controlling for only a small number of other influencing factors. This is important because standard birth certificates provide only a few variables in addition to weight. If known effects are obscured by noise from unknown sources, the effects of environmental stress may likewise be obscured. Second, if known effects are discernable, do known stressed populations show predictable patterns of depressed birth weight.

5500 BIOMEDICAL SCIENCES, BASIC STUDIES

5530 Agriculture And Food Technology

REFER ALSO TO CITATION(S) 31818, 32566

56 BIOMEDICAL SCIENCES, APPLIED STUDIES

5601 Radiation Effects

REFER ALSO TO CITATION(S) 32564

32571 (KURRI-TR—195, pp 87-91) **Study on lethal effect on cells by determination of ^{10}B in biological tissues and (n, α) reaction. Quantitative determination of ^{10}B in biological tissues by soiled state track detection.** Ishida, M.; Tsuruta, T.; Takagaki, M. (Kyoto Univ., Kumatori, Osaka (Japan). Research Reactor Inst.). Jan 1980. (In Japanese). NTIS (US Sales Only), PC A06/MF A01.

In Selective thermal neutron capture therapy of cancer cells using their specific functional differentiation.

As for the macroscopic distribution in tissues and microscopic distribution in cells of ^{10}B administrated to patients, which are important in thermal neutron capture therapy, it is difficult to say that the method of quantitative determination has been established. The authors tried some experiments by solid state track detection for the determination. That is, the trial determinations of boron in cells by solution method (wet process), filter paper method (dry process) and the method using an electron microscope are reported. If the maximum thermal neutron fluence available is assumed to be $10^{14}/cm^2$ and the minimum detectable surface density of etch pits is $10^4/cm^2$, the detection limit of ^{10}B concentration is estimated as about 10^{-2} $\mu g/ml$ either in the solution method or in the filter paper method. In the quantitative determination of boron distribution at cell level with an electron microscope, a sample of tissue was covered with a plastic thin film, etched after the irradiation with thermal neutrons, and the tissue and the thin film were simultaneously observed with the transmission electron microscope. The thin film thickness of about 0.1 μm is suitable for the sliced tissue of about 0.1 μm thick. The existence of fast neutrons at the time of

thermal neutron irradiation causes the generation of etch pits by recoiled particles in celluloid, and increases background counts, while γ-dose above 10^6 rad leads to the deterioration of celluloid composition. Some automatic methods of counting etch pits under consideration are described.

5600 BIOMEDICAL SCIENCES, APPLIED STUDIES

5601 Radiation Effects

32572 (PNL-SA—9133) Simplified evacuation model for estimating mitigation of early population exposures. Strenge, D.L. (Pacific Northwest Lab., Richland, WA (USA)). Dec 1980. Contract AC06-76RL01830. 7p. (CONF-810606—103). NTIS, PC A02/MF A01. Order Number DE82005884.

From American Nuclear Society's annual meeting; Miami Beach, FL, USA (7 Jun 1981).

The application of a simple evacuation model to the prediction of expected population exposures following acute releases of activity to the atmosphere is described. The evacuation model of Houston is coupled with a normalized Gaussian dispersion calculation to estimate the time integral of population exposure. The methodology described can be applied to specific sites to determine the expected reduction of population exposures due to evacuation.

32573 Pulmonary tumours in Syrian hamsters following inhalation of $^{239}PuO_2$. Thomas, R.G.; Drake, G.A.; London, J.E.; Anderson, E.C.; Prine, J.R.; Smith, D.M. (Los Alamos National Lab., NM (USA)). *International Journal of Radiation Biology and Related Studies in Physics, Chemistry and Medicine;* **40**: No. 6, 605-611(Dec 1981).

Syrian hamsters were exposed to various levels of aerosolized $^{239}PuO_2$ particles to attain a range of initial lung burdens (medians ranged from 40 to 144 nCi). They were allowed to live without sacrifice and had gross microscopic tissue examinations at death. Over a range of median lung doses from 4-12000 rad there was an average 2 per cent incidence of malignant tumours (adenocarcinomas) and 9 per cent incidence of total tumours (primarily adenomas). Some of these results are consistent with those from other laboratories using plutonium oxide aerosols but they represent considerably lower lung tumour incidences than previously observed in this laboratory using aerosols of $^{238}PuO_2$-ZrO_2 particles.

32574 Implications of new Hiroshima and Nagasaki dose estimates: cancer risks and neutron RBE. Straume, T.; Dobson, R.L. (California Univ., Livermore (USA). Lawrence Livermore National Lab.). *Health Physics;* **41**: No. 4, 666-671(Oct 1981).

The new Lawrence Livermore National Laboratory (LLNL) estimates of the neutron and gamma doses at Hiroshima and Nagasaki were applied to available biomedical data from A-bomb survivors. Dose-response relations for four major endpoints were re-analyzed: radiation-induced leukaemia, breast cancer, total malignancies and chromosome aberrations. The new LLNL doses fitted well with epidemiological observations in Japan, and dose-response relations derived from them gave improved consistency between A-bomb and other radiobiological data. From the results, inferences were drawn regarding risk coefficients for radiation-induced malignancies and, where possible, regarding neutron RBE.

32575 Differences between ^{201}Tl and ^{43}K tissue distribution in rested and exercised rats. Llaurado, J.G.; Madden, J.A.; Smith, G.A. *Nuclear-Medizin (Stuttgart);* **20**: No. 1, 40-45(Feb 1981).

A comparison is made of relative organ-to-plasma uptake of ^{43}K and ^{201}Tl in rats at rest and after exercise (two hour swimming). Organs were obtained 0.5 or 3 hrs after radionuclide injection. Thus, there were four groups each for ^{43}K and ^{201}Tl. For ^{201}Tl the triad kidneys-heart-adrenals was very consistent throughout the four experimental situations in showing the highest uptake, whereas for ^{43}K adrenals-heart-liver predominated at 0.5 hrs and thymus-liver at 3 hrs. The ratio $^{201}Tl/^{43}K$ in myocardium was always greater than unity in all four experimental situations. The heart-to-lung and heart-to-liver uptake ratios were lower in all cases for ^{43}K vs. ^{201}Tl. One of the most important findings was that exercise always determined an increase of these ratios for ^{201}Tl, but it had an unfavorable effect on the ^{43}K heart/lung ratio and no definite effect on the ^{43}K heart/liver ratio. Our findings are analyzed in the light of previous publications. It is concluded that these two ions have biologically important different characteristics and that excessive and seemingly unjustified emphasis has been made on their physiological similarity.

32576 Late excretion of plutonium following acquisition of known amounts. Rundo, J. pp 253-260 of Actinides in man and animals. Wrenn, M.E. (ed.). Los Altos, CA; RD Press (1981).

The urinary and fecal excretion rates of plutonium 10,000 days after intravenous injection of known amounts are compared with the predictions of various models. Both Langham's and Durbin's equations underestimated the urinary excretion by about an order of magnitude; the observed fecal excretion rates were also higher than the predictions. The total excretion rate predicted by the ICRP model was in quite good agreement with the observed rate, but it overestimated it at early times (<20 days). These differences are discussed. The increase in the excretion rate between 1500 days and 10,000 days is real, as shown by the increase in the estimate of body content of ^{239}Pu of former Manhattan Project plutonium workers, as calculated from the measured urinary excretion an application of Langham's equation. In one of these subjects the urinary excretion rate started to increase at about 6000 days, reached a maximum at about 9500 days, and declined for the next 2700 days.

32577 Deposition and retention of plutonium in the United States general population. McInroy, J.F.; Boyd, H.A.; Eutsler, B.C. pp 161-179 of Actinides in man and animals. Wrenn, M.E. (ed.). Los Altos, CA; RD Press (1981).

Since 1959, a Los Alamos Scientific Laboratory (LASL) study has analyzed over 5000 tissues from 1100 individuals of the nonoccupationally exposed general population for fallout plutonium. These data have been useful in determining the tissue distribution and the annual baseline levels of environmental plutonium in the US population. The effects of age, sex, date of death, cause of death, and geographic location of residence on the observed plutonium deposition have been evaluated. Because of the different biological turnover times of plutonium in the various organs of the body and the changing concentrations of plutonium in the atmosphere, the plutonium concentration ratios between tissues have changed as a function of time. However, our data indicate that over the past ten years, the highest concentrations in the general population are found in the tracheobronchial lymph nodes and the liver, and the lowest concentration are in the spleen, gonads, and kidney. The median body burdens of plutonium in the US population are estimated to have reached 12 pCi during the 1960's and have declined to about 2 pCi in 1977. Large errors in estimated skeletal burdens of plutonium may exist because of small specimen sample sizes and a lack of knowledge concerning the relative distribution of plutonium among the various bones of the human body.

32578 Determination of americium and plutonium in autopsy tissue: methods and problems. Boyd, H.A.; Eutsler, B.C.; McInroy, J.F. pp 43-52 of Actinides in man and animals. Wrenn, M.E. (ed.). Los Altos, CA; RD Press (1981).

The current methods used by the tissue analysis program at LASL for the determination of americium and plutonium in autopsy tissue are described. Problems affecting radiochemical yield are discussed, including problems associated with sample preparation, separation of plutonium from large amounts of bone ash, and reagent contamination. The average ^{242}Pu-tracer yield for 1800 Pu determinations is 78 +- 12%. The average ^{243}Am-tracer yield is 85 +- 7% for 40 determinations.

32579 In vivo measurement of actinides in the human lung. Anderson, A.L.; Campbell, G.W.; Griffith, R.V. pp 103-114 of Actinides in man and animals. Wrenn, M.E. (ed.). Los Altos, CA; RD Press (1981).

The problems associated with the in vivo detection and measurement of actinides in the human lung are discussed with various

measurement systems currently in use. In particular, the methods and calibration procedures employed at the Lawrence Livermore Laboratory, namely, the use of twin Phoswich detectors and a new, more realistic, tissue-equivalent phantom, are described. Methods for the measurement of chest-wall thickness, fat content, and normal human background counts are also discussed. Detection-efficiency values and minimum detectable activity estimates are given for three common actinides, ^{238}Pu, ^{239}Pu, and ^{241}Am.

32580 **Radioactivity in former workers at a thorium refinery.** Rundo, J.; Brewster, D.R.; Essling, M.A.; Sha, J.Y. pp 261-267 of Actinides in man and animals. Wrenn, M.E. (ed.). Los Altos, CA; RD Press (1981).

As part of an epidemiological study of the possible late biological effects of thorium, measurements have been made of radioactivity attributable to thorium daughters in almost 200 men who had worked in a thorium refinery which closed in 1973. For external gamma-ray measurements, statistically significant results ($> 2\ \sigma$) were obtained in 55 of these, with three showing more than 2 nCi ^{212}Bi in the thorax. For measurements of daughters of exhaled thoron, statistically significant results were obtained in almost every case, but for 63 subjects the values of <2 pCi of freely emanating ^{224}Ra at the mouth could not be attributed unequivocally to thorium acquired occupationally; 131 men exceeded this lower limit and four had more than 200 pCi of ^{224}Ra. The mean ratio of emanating ^{224}Ra to retained ^{212}Bi was 101 pCi/nCi with individual values ranging from 11 to 581. The problem of interpreting the data in terms of the actual amounts of throium in the thorax is discussed briefly.

32581 **Plutonium microdistribution in human bone.** Schlenker, R.A.; Oltman, B.G. pp 199-206 of Actinides in man and animals. Wrenn, M.E. (ed.). Los Altos, CA; RD Press (1981).

The amount and location of plutonium in bone from three humans injected during the mid-1940s have been studied by autoradiography and alpha-particle spectrometry. Concentrations are similar on endosteal surfaces, Haversian canal surfaces, and on the periosteal surfaces at the midshafts of long bones 17 months after injection. Endosteal surface concentrations are higher in the axial skeleton than in the appendicular skeleton 15 and 17 months post injection. For dosimetric purposes, volume deposits may be considered to be infinitely thick, whereas surface deposits may be considered to have zero thickness. Secondary surface deposits are dosimetrically important, even when the plutonium is almost completely deposited in bone volume.

32582 **Measurement of gap filling by bromouracil photolysis.** Ley, R.D. (Oak Ridge National Lab., TN). pp 493-498 of DNA repair: a laboratory manual of research procedures. Friedberg, E.C.; Hanawalt, P.C. (eds.). New York, NY; Marcel Dekker, Inc. (1981). Contract W-7405-ENG-26.

There is evidence that postreplication repair in bacteria requires a recombinational event and, as will be shown here, de novo DNA synthesis. The ability to selectively photolyze bromouracil (BU)-containing DNA can be used to quantify the amount of DNA synthesis involved in the repair of daughter strands of DNA synthesized on damaged templates. If the joining up of adjacent daughter strand pieces requires de novo DNA synthesis, BU, present during incubation for repair, will be inserted durng the gap-filling process. Exposure of the repaired DNA to 313 nm light will result in the selective rupture of the BU-containing regions and the reformation of the low molecular weight daughter strand pieces. The kinetics for the photolysis of the repaired DNA may be used to calculate the size of the BU-containing region. The observed size of the BU-substituted region synthesized during postreplication repair may not accurately reflect the size of the gap initially left in the daughter strands of DNA. The de novo synthesis involved in joining of the daughter strands probably includes the filling of an initial gap plus some degradation and resynthesis that occurs during the repair process.

32583 **Measurement of repair synthesis by photolysis of bromouracil.** Setlow, R.B. (Brookhaven National Lab., Upton, NY); Regan, J.D. pp 307-318 of DNA repair: a laboratory manual of research procedures. Friedberg, E.C.; Hanawalt, P.C. (eds.). New York, NY; Marcel Dekker, Inc. (1981).

During excision repair new bases are incorporated into parental DNA. If excision takes place in the presence of bromodeoxyuridine, the repaired regions may be detected by virtue of the fact that exposure of BrdU-containing DNA to ultraviolet light results in single-strand breaks revealed by sedimentation in alkali. It reopens the repaired patches and in principle permits one to determine the number and sizes of such regions, and to ascertain whether the distribution of repair over DNA molecules is asymmetric at the macromolecular level. It is not necessary to know the nature of the damage repaired. The ratio of direct single-strand breaks to alkali-labile products is different in vivo and in vitro, and the value in vitro depends on the concentration of radical scavengers. In the presence of such scavengers the number of breaks is much reduced. There is approximately one double-strand break for every 100 single-strand breaks. Researchers assume that the breaks resulting from uv irradiation of substituted DNA are random events and are independent of nearest neighbor frequencies or the positions of BrdU in chromatin. If the assumptions are not true the quantitative description below may not hold, but the qualitative picture is still correct. The breaks of interest are superimposed on breaks or crosslinks made by uv irradiation of unsubstituted DNA or of substituted DNA as a result of photolytic events on nonexcised adducts.

32584 **Nitroimidazoles of low toxicity and high activity as radiosensitizers of hypoxic tumor cells.** Lee, W.W. US Patent Application 180,373. 2 Aug 1980. 12p.

The present invention is based in part on the discovery that the compounds enumerated below are relatively low in toxicity while at the same time having a high degree of effectiveness as radiosensitizers of hypoxic cells in tumors to enhance the effectiveness of radiation therapy applied to the tumor: NSC 301467 N-(2-Hydroxyethyl)-2-(2-nitro-1-imidazolyl)acetamide and NSC 314055 N,N-Di-(2-hydroxyethyl)-2-(2-nitro-1-imidazolyl)acetamide.

32585 **Pathogenetic mechanism in lung fibrosis.** Witschi, H.; Haschek, W.M.; Meyer, K.R.; Ullrich, R.L.; Dalbey, W.E. (Oak Ridge National Lab., TN). *Chest;* **78**: No. 2, 395S-399S(Aug 1980). Contract W-7405-ENG-26.

Pathogenetic features common to many forms of interstitial pulmonary fibrosis are a chronic alveolitis, changes in the cellular composition of the alveolar zone, and derangement of the interstitial collagen. Fibrosis often appears to develop as a common sequel to injury when normal tissue repair fails to take place. Recently it was suggested that pulmonary fibrosis could develop following the interaction between an agent reaching the lung via the bloodstream and a toxic inhalant. Experiments described here were designed to test this hypothesis further.

5602 Thermal Effects

REFER ALSO TO CITATION(S) 32470, 32526, 32589

5603 Chemicals Metabolism And Toxicity

REFER ALSO TO CITATION(S) 31747, 32528, 32567, 32585

32586 **(BNL—30356) History of attempts to quantify environmental mutagenesis.** Hollaender, A. (Brookhaven National Lab., Upton, NY (USA); Associated Universities, Inc., Washington, DC (USA)). 1981. Contract AC02-76CH00016. 15p. (CONF-810992—3). NTIS, PC A02/MF A01. Order Number DE82005509.

From 3. international conference on environmental mutagens; Tokyo, Japan (20 Sep 1981).

It became obvious in the early 1960's that the ready recognition of mutations produced by chemicals could have a profound influence on the refinement of methods to detect environmental mutagens. The experience derived over the previous 30 years in char-

acterizing the effects of ionizing and ultraviolet radiation on the genetic mechanism came to serve us in good stead. Although the effects of chemicals are considerably more complicated and often require the analysis of individual substances, nonetheless, the area has developed rapidly in recent decades. The establishment and historical background of the International Association of Environmental Mutagen Societies (IAEMS) will be discussed. An attempt at the quantitation of chemical effects has been developed in comparison with radiation mutagenesis. As a first step, a definition of the Mutagen Burden or unavoidable exposure to chemicals will be discussed. A mathematical approach (Haynes/Eckhardt) will be considered and finally an outline for the comprehensive investigation of detailed interscience study will be made of less than six chemicals.

32587 **(LA-UR—81-3204) Sunlight activation of shale-oil byproducts as measured by genotoxic effects in cultured Chinese hamster cells.** Strniste, G.F.; Chen, D.J.; Okinaka, R.T. (Los Alamos National Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 8p. (CONF-811086—2). NTIS, PC A02/MF A01. Order Number DE82002349.

From 6. symposium on polycyclic aromatic hydrocarbons; Columbus, OH, USA (27 Oct 1981).

Activation of certain classes of promutagens/procarcinogens can be accomplished by exposure to various radiation sources. Retort processes currently in use in the production of shale oil generate significant quantities of process waters which contain a wide spectrum of uv-absorbing, organic material. Photoactivation of these waters with an artificial source of NUV results in genotoxic events in cultured mammalian cells. Since significant amounts (2 to 4%) of solar radiation reaching the earth's surface is NUV, we were concerned about potential biological effects resulting from solar-irradiated waste streams. This paper summarizes new and previously published data concerning the induction of both cytotoxicity and mutagenicity in cultured Chinese hamster cells (line CHO) after their exposure to a particular oil shale retort process water and natural sunlight.

32588 **Sperm assays in man and other mammals as indicators of chemically induced testicular dysfunction.** Wyrobek, A.J. (Lawrence Livermore National Lab., CA). pp 495-506 of Short-term bioassays in the analysis of complex environmental mixtures II. Waters, M.D.; Sandhu, S.S.; Huisingh, J.L.; Claxton, L.; Nesnow, S. (eds.). New York, NY; Plenum Publishing Corporation (1981).

This paper describes the application and methodology of sperm assays in men and laboratory animals and discusses the predictive value of induced sperm changes, correlations of results to carcinogenicity and mutagenicity, and the relative strengths and weaknesses of sperm assays.

32589 **Combined effects of nickel, chlorine, and temperature on the mortality of rainbow trout, Salmo gairdneri.** Anderson, D.R. Seattle, WA; Univ. of Washington (1981). 215p. University Microfilms Order No. 81-21,178.

Thesis (Ph. D.).

The purpose of the research was to determine the type of toxic interaction of chlorine, nickel, and temperature on rainbow trout; to develop a multiple regression model of the multiple toxicant tests; and to provide a biological explanation of the interaction. Objectives in support of the above were: to determine the acute 96 hr nickel LC50 and 95% confidence interval as a basis for a nickel toxic unit with rainbow trout; to determine under acute toxicity test conditions the effect of 0.018 ppM total residual chlorine on the accumulation of nickel with a tracer of nickel, ^{63}Ni.

32590 **Use of a demographic model for health risk assessment.** Collins, J.J.; Ginevan, M.E.; Grahn, D.; Lundy, R.T. (Argonne National Lab., IL). *EPA (Environmental Protection Agency) Journal;* 220-221(1981). Contract W-31-109-ENG-38.

Assessment of the health consequences of populations exposed to various environmental pollutants has become an important issue because of the growing number of known or suspected carcinogens. To date, three projection methods have been used in health risk assessment and each of these methods has its own shortcomings. Presented is a fourth model which is both more versatile and realistic because it incorporates age, fertility and mortality structure and can follow populations through time under changing levels of mortality, fertility and pollution exposure.

32591 **Biological monitoring of fluidized bed coal combustion operations. II. Mammalian responses following exposure to gaseous effluents.** Kirchner, F.R.; Buchholz, D.M.; Pahnke, V.A.; Reilly, C.A. Jr. (Argonne National Lab., IL). pp 421-430 of Short-term bioassays in the analysis of complex environmental mixtures II. Waters, M.D.; Sandhu, S.S.; Huisingh, J.L.; Claxton, L.; Nesnow, S. (eds.). New York, NY; Plenum Publishing Corporation (1981).

Several coal combustion technologies, including fluidized bed combustion, have potential for meeting government-imposed environmental pollution guidelines. Fluidized bed combustion enables the combustion of high sulfur coal while limiting the emission of sulfur dioxide. In a previous study, detrimental biological effects were observed in animals exposed to whole effluents derived from the atmospheric pressure fludized bed coal combustor operated by the Chemical Engineering Division at Argonne National laboratory, Argonne, IL. In the study presented here, the animals were exposed only to gaseous FBC components in order to determine which effluent components are responsible for these observed biological effects. Three testing systems were applied. To assess pulmonary alveolar macrophage function, one of the organisms's first lines of defense against airborne pollutants, Brennan et al. modified the assay of neutrophil function first described by Tan et al. The assay differentiates between defective phagocytosis and impaired intracellular killing. Effectice PAM function is required to eliminate inhaled microorganisms, particulate pollutants, and other inhaled particles. Increased numbers of PAMs were observed in the lungs of animals exposed only to FBC fly ash, taxing the lung macrophage progenitor stem cell compartment. To assess the systemic toxic effects following acute exposure to FBC gaseous effluent, the Till and McCulloch spleen colony assay was used. The lungs and other tissues thought to be at risk were also examined histopathologically during and after the exposures.

32592 **Biological monitoring of fludized bed coal combustion operations. I. Increased mutagenicity during periods of incomplete combustion.** Kubitschek, H.E.; Williams, D.M.; Kirchner, F.R. (Argonne National Lab., IL). pp 411-420 of Short-term bioassays in the analysis of complex environmental mixtures II. Waters, M.D.; Sandhu, S.S.; Huisingh, J.L.; Claxton, L.; Nesnow, S. (eds.). New York, NY; Plenum Publishing Corporation (1981).

The Ames Salmonella microsome assay is used extensively to screen environmental pollutants because of its rapidity, its relatively low cost, and its sensitivity in detecting carcinogens. Researchers applied the Ames assay to the study of mutagenic particulates produced by an experimental process-development fluidized bed combustor at Argonne National Laboratory. This FBC also was used for mouse inhalation toxicology experiments. The original plan was to determine the relative mutagenicities of the different effluents produced by the FBC and to measure the mutagenicity of the particulate effluent during the mouse exposures. However, our earliest measurments indicated that the mutagenicity was much greater than that for a larger FBC. This excessive mutagenicity in the Argonne FBC was traced to operating conditions: fly ash deposited on the final filter during start-up periods was up to 60 times as mutagenic as that produced during steady operation. This finding, and the variability in the mutagenicity of the fly ash produced during a 1000-h run, made it apparent that the Ames assay might be used to examine the effects of process conditions on levels of mutagenicity.

32593 **Toxicity of a coal liquefaction product to aquatic organisms.** Giddings, J.M.; Parkhurst, B.R.; Gehrs, C.W.; Millemann, R.E. (Oak Ridge National Lab., TN). *Bulletin of Environmental Contamination and Toxicology;* **25**: 1-6(1980). Contract W-7405-ENG-26.

As coal liquefaction processes approach commercialization in the United States, there is a growing need for information on their potential environmental impacts. Past oil spill experiences will not be adequate for predicting the effects of coal-derived oils, because the latter are chemically quite different from petroleum prod-

ucts. Using acute bioassay tests, a representative coal liquefaction product was compared with a petroluem-derived residual fuel oil and a diesel fuel, materials whose ecological effects have been documented following actual spills over the past 15 years. The acute toxicity of water soluble fractions (WSFs) of the three oils to two freshwater algae and one freshwater crustacean was determined. The WSFs were tested instead of the whole oils because (a) the water soluble components of an oil are responsible for most of its acute toxicity; and (b) while spilled oil can be contained and often recovered, the water with which it comes in contact will affect a larger area and for a longer time.

5600 BIOMEDICAL SCIENCES, APPLIED STUDIES

5604 Other Environmental Pollutant Effects

REFER ALSO TO CITATION(S) 32738

58 GEOSCIENCES

5801 Geology And Hydrology

32594 **(LA-UR—81-3700) Numerical prediction of subsidence with coupled geomechanical-hydrological modeling.** Girrens, S.P.; Anderson, C.A.; Bennett, J.G.; Kramer, M. (Los Alamos National Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 9p. (CONF-811173—1). NTIS, PC A02/MF A01. Order Number DE82006136.

From Workshop on surface subsidence due to underground mining; Morgantown, WV, USA (30 Nov 1981).

A coupled finite element geomechanical-hydrology code is currently under development for application to the problem of predicting groundwater disturbances associated with mine subsidence. The structural-fluid coupling is addressed by calculating the subsided mine geometry, with emphasis placed on determining the strata disturbance and locating damaged regions, for input into a hydrology code, which determines localized volume flow rates and aquifer fluctuations. Benefits from coupling will be best realized when field measurements, an additional aspect of the study concurrent with analytical investigations, indicating the relationship between increasing rock strain and increasing permeability are incorporated into hydraulic material descriptions. Hydrologic and structural calculations are presented to demonstrate computational capabilities applicable to mine subsidence.

5800 GEOSCIENCES

5801 Geology And Hydrology

32595 **(NP—2902469) Ground-water levels in Alabama. For observation wells measured periodically, August 1952-July 1977. Circular 105.** Davis, M.E. (Geological Survey, University, AL (USA); Alabama Geological Survey, University (USA)). 5 Mar 1981. 93p. Publications Sales Office, Geological Survey of Alabama, P.O. Drawer O, University, AL 35486 $4.00.

Portions of document are illegible.

A systematic observation well network in Alabama was started in 1940. This report summarizes the general relationship between geology and groundwater availability. Unpublished water-level data collected periodically since 1952 at 254 observation wells are listed along with the location description and general information on construction of the observation wells. Publications containing water-level data from selected observation wells are also listed.

32596 **(NP—2902508) Thirty-ninth biennial report of the state geologist for 1979-1980.** (Wyoming Geological Survey, Laramie (USA)). Dec 1980. 9p. Wyoming Geological Survey, Box 3008, University Station, Laramie, WY 82070.

Portions of document are illegible.

The Wyoming Geological Survey, a state agency, attempts to supply the State with significant and timely reports and maps on all aspects of geology and mineral resources. Overall operation of the Survey can be grouped under the three general categories of services, investigations, and publications. Contents of this biennial report are as follows: introduction; organization and administration; Wyoming's mineral production and related activities which cover services, staff activities (oil and gas section, mineral section, coal section, stratigraphy section, environmental section), publications, and outside funding and cooperative projects; and activities that will influence Wyoming's future. (ATT)

32597 **K-Ar radiometric age determinations of the south-Alpine metamorphic complex, western Orobic Alps (Italy).** Bocchio, R.; De Capitani, L.; Liborio, G.; Mottana, A.; Nicoletti, M.; Petrucciani, C. *Neues Jahrbuch fuer Mineralogie, Monatshefte;* No. 7, 289-307(Jul 1981).

K-Ar age determinations have been carried out on samples from the upper Lake Como region in the south-Alpine basement, where two metamorphic units have been distinguished previously on the basis of their pressure regimes. Considerations on the significance of K-Ar vs. Rb-Sr age determinations in metamorphic rocks, and comparisons with results obtained in other areas of the metamorphic basement of the Alps, suggest that the low-pressure unit metamorphism is to be related to the Hercynian main metamorphic event, while the intermediate-presssure one may possibly be related to the Caledonian cycle. These inferred ages settle the doubts arisen from a contradiction apparent in the 'Metamorphic facies map of the Alps', where this portion of the basement has been assigned to the Variscan (= Hercynian) metamorphic cycle, in spite of its intermediate-pressure regime testified by the widespread occurrence of kyanite, a mineral very unusual in the Hercynotypic metamorphic rocks.

32598 **Wasserwirtschaftlicher Rahmenplan Isar. Bd. 2. Karten, Tabellen. (General plan for hydrological conditions in the Isar River region. Vol. 2).** Muenchen, Germany, F.R.; Bayerisches Staatsministerium fuer Landesentwicklung und Umweltfragen (1979). 48p.

The 'Rahmenplan Isar' (General plan for the Isar River) is based on the objectives of regional planning stated in the 'Landesentwicklungsprogramm Bayern' (Bavaria Plan for Regional Development). In this framework, the hydrological conditions in the Isar region will be analyzed and possibilities of development pointed out. The statements of the plan go beyond the year 2000 as general plans for hydrology are usually drawn up on a long-term basis.

32599 **Wasserwirtschaftlicher Rahmenplan Isar. Bd. 1. Planung, Gutachten. (General plan for hydrological conditions in the Isar River region. Vol. 1).** Muenchen, Germany, F.R.; Bayerisches Staatsministerium fuer Landesentwicklung und Umweltfragen (1979). 320p.

The 'Rahmenplan Isar' (General plan for the Isar River) is based on the objectives of regional planning stated in the 'Landesentwicklungsprogramm Bayern' (Bavaria Plan for Regional Development). In this framework, the hydrological conditions in the Isar region will be analyzed and possibilities of development pointed out. The statements of the plan go beyond the year 2000 as general plans for hydrology are usually drawn up on a long-term basis.

32600 **Isarplan. Kurzfassung. (Plan of the Isar River).** Muenchen, Germany, F.R.; Bayerisches Staatsministerium fuer Landesentwicklung und Umweltfragen (1979). 128p.

The Rahmenplan Isar (general plan for the Isar River) is based on the objectives of regional planning started in the Landesentwicklungsprogramm Bayern (Bavarian plan for regional development). In its framework, the hydrological conditions in the Isar region will be analysed and possibilities of development pointed out. The statements of the plan go beyond the year 2000 as general plans for hydrology are usually drawn up on a long-term basis.

5802 Geophysics

32601 **Influence of new technologies in wireline logging on the profitability of drilling projects.** Junk, H. *Oil Gas--European Magazine (English Translation);* 7: No. 2, 41-47(1981).

After a historical review, the recent development of wireline logging and evaluation in the OeMW AG is described. The following are the distinguishing features of the developments made during the 70's: drilling to greater depths; exploitation of previously uneconomical deposits; the increasing importance of all measures for improving the recovery.

5803 Mineralogy, Petrology, And Rock Mechanics

REFER ALSO TO CITATION(S) 31769, 31770, 31795, 31808

5804 Geochemistry

32602 **(PNL-SA—9848) Solid phases limiting the concentration of dissolved constituents in basalt aquifers of the Columbia Plateau in eastern Washington.** Deutsch, W.J.; Jenne, E.A.; Krupka, K.M. (Pacific Northwest Lab., Richland, WA (USA)). 1981. Contract AC06-76RL01830. 8p. NTIS, PC A02/MF A01. Order Number DE82005874.

The purposes of this study were: (1) to provide information on the solid phases which are in apparent equilibrium with ground waters of basalt aquifers, and (2) to further develop the capability of geochemical modeling to support solute transport studies and performance assessments of nuclear waste repositories. The basalt aquifers of the Columbia Plateau in eastern Washington were chosen as the study area because: (1) regional ground-water analyses are readily available, (2) these basalts are a potential medium for a nuclear-waste repository, and (3) mineralogical analyses from local site studies are available.

5805 Oceanography

32603 **(DOE/EV/00936—T3) Biological processes in the water column of the South Atlantic Bight. Progress report.** Paffenhoefer, G.A.; Yoder, J.A. (Skidaway Inst. of Oceanography, Savannah, GA (USA)). 21 Dec 1981. Contract AS09-76EV00936. 192p. NTIS, PC A09/MF A01. Order Number DE82007332.

Individual projects are included in the data base on phytoplankton population dynamics. (PSB)

64 PHYSICS RESEARCH

6401 Astrophysics And Cosmology

REFER ALSO TO CITATION(S) 32427, 32428, 32429, 32430, 32431, 32432, 32433, 32434, 32435, 32437, 32440, 32733, 32750, 32751

32604 **(DOE/ER/04699—7) Experiments using the TASS and HISS spectromcters at the Bevalac. Annual progress report, April 1, 1981-March 31, 1982.** Kirk, P.N. (Louisiana State Univ. and Agricultural and Mechanical Coll., Baton Rouge (USA)). 1982. Contract AS05-76ER04699. 150p. NTIS, PC A07/MF A01. Order Number DE82006838.

Activities of the LSU intermediate energy physics group during the contract year that began April 1, 1981 are described. The principal activities were: (1) an ongoing experiment mounted on the TASS spectrometer to measure the relative momentum between a pair of nucleons within a nucleus; (2) a proposal to search for quark condensation in collisions between relativistic heavy nuclei by measuring cross sections for dilepton production; and (3) an ongoing experiment mounted on the HISS spectrometer. (GHT)

32605 **(JILA—117) Atlas of Wolf-Rayet line profiles.** Smith, L.F.; Kuhi, L.V. (Joint Inst. for Lab. Astrophysics, Boulder, CO (USA)). 11 Sep 1981. 96p. Univ. of Colorado, Boulder, CO.

The aim of the present Atlas is to provide intensity tracings of the visible spectra from 3000 to 6600 A of WN stars over a wide range of subclasses. Also, opinions of the identifications of the spectral features and measurements of their equivalent widths, with conversion, also, to flux units are provided. Inasmuch as the data for a given wavelength region of a given star generally depend on only one spectrogram, accuracy is not the highest attainable. The emphasis of the present study is uniformity and wide coverage for comparative purposes. To that end, the spectra are presented in a loose-leaf format to facilitate intercomparisons. (WHK)

32606 **(UCRL—86964) Studies of the nuclear equation of state using numerical calculations of nuclear drops collisions.** Alonso, C.T.; LeBlanc, J.M.; Wilson, J.R. (Lawrence Livermore National Lab., CA (USA)). Nov 1981. Contract W-7405-ENG-48. 13p. (CONF-811174—2). NTIS, PC A02/MF A01. Order Number DE82005869.

From 2. convention of the international colloquium on drops and bubbles; Monterey, CA, USA (19 Nov 1981).

A numerical calculation for the full thermal dynamics of colliding nuclei has been developed. Preliminary results are reported for the thermal fluid dynamics in such processes as Coulomb scattering, fusion, fusion-fission, bulk oscillations, compression with heating, and collisions of heated nuclei.

32607 **Early Universe.** Kolb, E.W. (Los Alamos Scientific Lab., NM (USA); California Univ., Santa Barbara (USA). Inst. for Theoretical Physics); Turner, M.S. (California Univ., Santa Barbara (USA). Inst. for Theoretical Physics; Chicago Univ., IL (USA). Astronomy and Astrophysics Center). *Nature (London);* **294**: No. 5841, 521-526(10 Dec 1981).

A review is given of some of the work presented at a week-long workshop which was the culmination of a six month program on the early Universe, held at the Institute for Theoretical Physics, University of California. The purpose of the program was to focus on the close relationship between cosmology and particle physics with especial reference to the study of grand unification schemes. Subjects covered in this review include; standard big-bang model, elementary particles and interactions, primordial nucleosynthesis, baryosynthesis, galaxy formation, exotic relics from the big bang, phase transitions, fundamental problems.

32608 **Calculation of cascade curves for interactions of protons and nuclei of energy >= approximately 1 TeV/nucleon in lead.** Deshurko, M.D.; Hein, L.A.; Rakobolskaya, I.V.; Zatsepin, V.I. (Institute of Nuclear Physics, Moscow State University (USSR)). pp 93 of Conference papers. 17. International cosmic ray conference, Paris, 13-25 July 1981. Vol. 8, T Session. Paris, France; Commissariat a l'Energie Atomique (1981).

From 17. international cosmic ray conference; Paris, France (13 Jul 1981).

32609 **Analytic model for the differential energy spectra of cosmic rays.** Adams, J.H. Jr.; Silberberg, R.; Tsao, C.H. (Naval Research Lab., Washington, DC (USA)). pp 94-97 of Conference papers. 17. International cosmic ray conference, Paris, 13-25 July 1981. Vol. 8, T Session. Paris, France; Commissariat a l'Energie Atomique (1981).

From 17. international cosmic ray conference; Paris, France (13 Jul 1981).

It is often necessary, in the course of planning experiments, to calculate the flux of some cosmic ray nuclide at one or more energies. To simplify this task, we have developed a straightforward analytic model of the cosmic-ray environment near earth.

32610 **Satellite observation of cosmic ray air showers.** Benson, R. (Texas A and M Univ., College Station (USA). Dept. of Physics); Linsley, J. (New Mexico Univ., Albuquerque (USA). Dept. of Physics and Astronomy). pp 145-148 of Conference papers. 17. International cosmic ray conference, Paris, 13-25 July 1981. Vol. 8, T Session. Paris, France; Commissariat a l'Energie Atomique (1981).

From 17. international cosmic ray conference; Paris, France (13 Jul 1981).

The arrival trajectories of cosmic rays with energies greater than 10^{19}eV afford the possibility of being traced backwards for distances comparable to the size of the Galaxy. They provide a means of testing models of the Galactic magnetic field as well as models of the origin of extra-Galactic cosmic rays. The large air showers produced by such cosmic rays can be observed by means of the atmospheric scintillation light they produce. It is shown here that a satellite-based system consisting of a single large mirror with an array of photon sensors at its focus would have outstanding advantages for the study of the highest energy cosmic rays.

32611 **Neutron emission in the case of the capture of the cosmic ray μp-meson component in a lead sample.** Blokh, Ya.L.; Rogovaya, S.I. (Izmiran, Troitsk, Moscow Region (USSR)). pp 149-151 of Conference papers. 17. International cosmic ray conference, Paris, 13-25 July 1981. Vol. 8, T Session. Paris, France; Commissariat a l'Energie Atomique (1981).

From 17. international cosmic ray conference; Paris, France (13 Jul 1981).

An attempt is made to theoretically estimate the contribution of the neutrons produced as a result of the μ^--component interaction with lead atoms to the total number of the particles detected by a neutron monitor.

32612 **Lateral distribution of muon in EAS.** Hara, T.; Hatano, Y.; Hayashida, N. (Tokyo Univ. (Japan)). pp 1 of Conference papers. 17. International cosmic ray conference, Paris, 13-25 July 1981. Vol. 6, EA Session. Paris, France; Commissariat a l'Energie Atomique (1981).

From 17. international cosmic ray conference; Paris, France (13 Jul 1981).

32613 **Muon size and muon fluctuation.** Hara, T.; Hatano, Y.; Hayashida, N. (Tokyo Univ. (Japan)). pp 2 of Conference papers. 17. International cosmic ray conference, Paris, 13-25 July 1981. Vol. 6, EA Session. Paris, France; Commissariat a l'Energie Atomique (1981).

From 17. international cosmic ray conference; Paris, France (13 Jul 1981).

32614 **Analysis of experimental data on EAS.** Grishina, N.V.; Fomin, Y.A.; Lebedev, A.P. (Moskovskij Gosudarstvennyj Univ. (USSR). Nauchno-Issledovatel'skij Inst. Yadernoj Fiziki). pp 3-7 of Conference papers. 17. International cosmic ray conference, Paris, 13-25 July 1981. Vol. 6, EA Session. Paris, France; Commissariat a l'Energie Atomique (1981).

From 17. international cosmic ray conference; Paris, France (13 Jul 1981).

The experimental data on muon density in EAS for various threshold muon energies are presented. The correlation between EAS muon characteristics and the age parameter of electron-photon component has been analysed. The comparison of experimental data and EAS model calculations is given.

32615 **Cosmic ray air showers (>10^{18} eV).** Bray, A.D.; Horton, L.; McCusker, C.B.A.; Peak, L.S.; Ulrichs, J.; Winn, M.M. (Sydney Univ. (Australia)). pp 7 of Conference papers. 17. International cosmic ray conference, Paris, 13-25 July 1981. Vol. 6, EA Session. Paris, France; Commissariat a l'Energie Atomique (1981).

From 17. international cosmic ray conference; Paris, France (13 Jul 1981).

32616 **Muon densities and muon/electron ratios in EAS.** Armitage, R.; Blake, P.R.; Nash, W.F.; O'Connell, B.; Sephton, A.; Shelley, C.C.; Strutt, R.B. (Nottingham Univ. (UK)). pp 12-15 of Conference papers. 17. International cosmic ray conference, Paris, 13-25 July 1981. Vol. 6, EA Session. Paris, France; Commissariat a l'Energie Atomique (1981).

From 17. international cosmic ray conference; Paris, France (13 Jul 1981).

A study has been made of fluctuations in the muon densities and muon /electron ratios measured in EAS recorded at Haverah Park. The muon densities (R > 50m) are found to be insensitive to variations in the longitudinal development of EAS. The muon/electron ratio is found to be sensitive to shower development for core distances less than 300m.

32617 **Spatial characteristics of the muon component of large air showers.** Gibson, A.I.; McComb, T.J.L.; Turver, K.E. (Durham Univ. (UK)). pp 16-19 of Conference papers. 17. International cosmic ray conference, Paris, 13-25 July 1981. Vol. 6, EA Session. Paris, France; Commissariat a l'Energie Atomique (1981).

From 17. international cosmic ray conference; Paris, France (13 Jul 1981).

Measurements of the muon angle to the shower core direction and the spread of angle of muons in showers of energy >= 10^{17} eV are reported and compared with computer simulations. The data are used to derive the depth of electron cascade maximum.

32618 **Muon time spreads in EAS.** Blake, P.R.; O'Connell, B.; Mann, D.M.; Nash, W.F.; Strutt, R.B. (Nottingham Univ. (UK)). pp 20-23 of Conference papers. 17. International cosmic ray conference, Paris, 13-25 July 1981. Vol. 6, EA Session. Paris, France; Commissariat a l'Energie Atomique (1981).

From 17. international cosmic ray conference; Paris, France (13 Jul 1981).

The results of measurements on the rise times of muon scintillator responses recorded from EAS detected at Haverah Park are presented. The average muon time spread is found to be a function of core distance, zenith angle and muon threshold energy. Significant fluctuations in muon time spreads are shown to exist between showers.

32619 **Arrival time distribution of muons in large air showers observed at 900m above sea level.** Tamura, T.; Sugawa, N.; Inoue, N. (Tokyo Inst. of Tech. (Japan). Dept. of Physics). pp 24-26 of Conference papers. 17. International cosmic ray conference, Paris. 13-25 July 1981. Vol. 6, EA Session. Paris, France; Commissariat a l'Energie Atomique (1981).

From 17. international cosmic ray conference; Paris, France (13 Jul 1981).

The arrival time distribution of muons (>1GeV) in large air showers above 10^{17} eV has been measured at core distances from 100m to 250m in the Akeno air shower array (900m a.s.l.) using four $2m^2$ scintillation detectors and an equipment with a time response of 3.5ns in rise time and 7.0ns in FWHM. The time from 20% to 70% in integral arrival time distribution (tsub(20-70)) suggests a very fast development of muons expected from the enhanced Esup(1/2) multiplicity law and the rising cross section for primary protons. This result is consistent with those obtained from the measurement of arrival time distribution of muons and the equi-intensity cuts of muon-size spectra at Chacaltaya (5200m a.s.l.).

32620 **Measurement of the elongate rate from 2 x 10^{17} - 10^{20}eV.** Walker, R.; Watson, A.A. (Leeds Univ. (UK). Dept. of Physics). pp 31-34 of Conference papers. 17. International cosmic ray conference, Paris, 13-25 July 1981. Vol. 6, EA Session. Paris, France; Commissariat a l'Energie Atomique (1981).

From 17. international cosmic ray conference; Paris, France (13 Jul 1981).

A measurement of the elongation rate of the depth of maximum of air showers has been made for showers initiated by primary cosmic rays of 2 x 10^{17} to 10^{20}eV. The elongation rate is measured to be 70 +- 5 gcm^{-2}/ decade. Limits to the mass change over this energy range are discussed for a number of assumptions about the relevant nuclear physics.

32621 Comparison of muon rise-times and muon/electron density ratios with model calculations. Armitage, R.; Blake, P.R.; Mann, D.M.; Nash, W.F.; O'Connell, B. (Nottingham Univ. (UK)). pp 35-38 of Conference papers. 17. International cosmic ray conference, Paris, 13-25 July 1981. Vol. 6, EA Session. Paris, France; Commissariat a l'Energie Atomique (1981).

From 17. international cosmic ray conference; Paris, France (13 Jul 1981).

Measurements of muon arrival time distributions and muon/water Cerenkov response ratios (muon/electron ratios) have been obtained for showers with primary energies > = approximately to 10^{17}eV at Haverah Park. The measured average properties and fluctuations of these two parameters are compared with the predictions of shower simulations carried out by the University of Leeds and University of Durham groups.

32622 Lateral electron distribution in EAS of different sizes. Kristiansen, G.B.; Kulikov, G.V.; Solovieva, V.I. (Moskovskij Gosudarstvennyj Univ. (USSR). Nauchno-Issledovatel'skij Inst. Yadernoj Fiziki). pp 39-42 of Conference papers. 17. International cosmic ray conference, Paris, 13-25 July 1981. Vol. 6, EA Session. Paris, France; Commissariat a l'Energie Atomique (1981).

From 17. international cosmic ray conference; Paris, France (13 Jul 1981).

The lateral electron distributions in EAS in narrow size ranges are analysed. It is shown that the shape of the lateral electron distribution at distances of up to 100m from the shower core does not depend on size N when N varies within the $5x10^4$ - $2x10^6$ interval. For EAS with greater N, this is also valid, but at greater distances.

32623 Average properties and fluctuations of the lateral distribution of large air showers. Coy, R.N.; England, C.D.; Pearce, D.; Reid, R.J.O.; Watson, A.A. (Leeds Univ. (UK). Dept. of Physics). pp 43-46 of Conference papers. 17. International cosmic ray conference, Paris, 13-25 July 1981. Vol. 6, EA Session. Paris, France; Commissariat a l'Energie Atomique (1981).

From 17. international cosmic ray conference; Paris, France (13 Jul 1981).

In this paper we describe the results of measurements on the lateral distribution of the water-Cerenkov signal recorded in showers initiated by primaries of energy greater than 2.10^{17}eV. The measurements were made using the deep water-Cerenkov detectors of the Haverah Park infilled array (Edge et al 1977) during the period November 1976 - December 1980. Since our report at the Kyoto Conference (England et all 1979) we have almost doubled the data set which now consists of approximatively 1300 showers with zenith angles less than 45° and with primary energies in the range 2.10^{17} to 10^{19}eV. The variation of the lateral structure function with energy and with zenith angle are described and the fluctuations in shower structure observed at fixed energy and zenith angle are derived. The elongation rate has been evaluated under certain assumptions.

32624 Fluctuations of density flux and lateral distribution of EAS particles with $E_0 Wh 10^{17}$eV. Diminstein, O.S.; Efimov, N.N.; Kaganov, L.I.; Pravdin, M.I. (Institute of Cosmophysical Research and Aeronomy, Yakutsk, (USSR)); Khristiansen, G.B. (Moskovskij Gosudarstvennyj Univ. (USSR). Nauchno-Issledovatel'skij Inst. Yadernoj Fiziki). pp 47-50 of Conference papers. 17. International cosmic ray conference, Paris, 13-25 July 1981. Vol. 6, EA Session. Paris, France; Commissariat a l'Energie Atomique (1981).

From 17. international cosmic ray conference; Paris, France (13 Jul 1981).

It is shown that the conventional picture of Poissonian fluctuations of the density flux is true at moderate core distance. On this basis the simulation was carried out taking into account the primary spectrum and lateral distribution function (LDF) fluctuations. Analysis of lateral distribution is described and the appropriate results are summarized.

32625 Multi-parameter measurements of shower structure above 10^{17}eV. Coy, R.N.; England, C.D.; Reid, R.J.O. (Leeds Univ. (UK). Dept. of Physics). pp 51 of Conference papers. 17. International cosmic ray conference, Paris, 13-25 July 1981. Vol. 6, EA Session. Paris, France; Commissariat a l'Energie Atomique (1981).

From 17. international cosmic ray conference; Paris, France (13 Jul 1981).

32626 Size dependence of various observables at Akeno. Hara, T.; Hatano, Y.; Hayashida, N. (Tokyo Univ. (Japan)). pp 52-55 of Conference papers. 17. International cosmic ray conference, Paris, 13-25 July 1981. Vol. 6, EA Session. Paris, France; Commissariat a l'Energie Atomique (1981).

From 17. international cosmic ray conference; Paris, France (13 Jul 1981).

In this paper special attention is paid to the electron components, especially lateral distribution of electrons, its fluctuation, frequency attenuation length of EAS, electron shower front and muon density at 70m from the core.

32627 Size and density spectra of vertical and inclined showers at Akeno. Hara, T.; Hatano, Y.; Hayashida, N. (Tokyo Univ. (Japan)). pp 56 of Conference papers. 17. International cosmic ray conference, Paris, 13-25 July 1981. Vol. 6, EA Session. Paris, France; Commissariat a l'Energie Atomique (1981).

From 17. international cosmic ray conference; Paris, France (13 Jul 1981).

32628 Cascade development of cosmic ray showers. Andam, A.A.; Craig, M.A.B.; Chantler, M.P.; McComb, T.J.L.; Orford, K.J.; Turver, K.E.; Walley, G.M. (Durham Univ. (UK)). pp 57-60 of Conference papers. 17. International cosmic ray conference, Paris, 13-25 July 1981. Vol. 6, EA Session. Paris, France; Commissariat a l'Energie Atomique (1981).

From 17. international cosmic ray conference; Paris, France (13 Jul 1981).

The preliminary data on cascade development deduced from Cerenkov light measurements at Haverah Park and the Dugway Cerenkov light experiment are compared with other results. The rate of charge of depth of maximum with primary energy is interpreted as an indicator of the primary mass composition.

32629 Character of nuclear interactions and composition of primary cosmic rays at 10^{15}eV to 10^{20}eV deduced from air showers observed at 5200m and 900m above sea level. Kakimoto, F.; Suga, K.; Inoue, N. (Tokyo Inst. of Tech. (Japan). Dept. of Physics). pp 61 of Conference papers. 17. International cosmic ray conference, Paris, 13-25 July 1981. Vol. 6, EA Session. Paris, France; Commissariat a l'Energie Atomique (1981).

From 17. international cosmic ray conference; Paris, France (13 Jul 1981).

32630 Lateral distribution of electron-photon component in large cosmic ray showers. Lai, K.F.; MacKeown, P.K. (Hong Kong Univ.). pp 62 of Conference papers. 17. International cosmic ray conference, Paris, 13-25 July 1981. Vol. 6, EA Session. Paris, France; Commissariat a l'Energie Atomique (1981).

From 17. international cosmic ray conference; Paris, France (13 Jul 1981).

32631 Lateral distributions of electrons and muons in EAS. Dedenko, L.G. (Moskovskij Gosudarstvennyj Univ. (USSR). Nauchno-Issledovatel'skij Inst. Yadernoj Fiziki). pp 63-65 of Conference papers. 17. International cosmic ray conference, Paris, 13-25 July 1981. Vol. 6, EA Session. Paris, France; Commissariat a l'Energie Atomique (1981).

From 17. international cosmic ray conference; Paris, France (13 Jul 1981).

Lateral distributions of electrons and muons in EAS are calculated in the energy range of 10^{17} - 10^{19}eV for fixed primary

energy and for fixed density of particles for scaling model. A selection of showers inside the finite solid angle bin is taken into account.

32632 **Analysis of giant air showers.** Cachon, A. (Observatoire du Pic du Midi, 65 - Bagneres-de-Bigorre (France)); Capdevielle, J.N. (Bordeaux-1 Univ., 33 (France)). pp 66-69 of Conference papers. 17. International cosmic ray conference, Paris, 13-25 July 1981. Vol. 6, EA Session. Paris, France; Commissariat a l'Energie Atomique (1981).

From 17. international cosmic ray conference; Paris, France (13 Jul 1981).

An extensive semi Monte Carlo simulation at 10^{19}GeV has been carried out. The distribution of age parameter and the aspects of lateral profiles is discussed for different kind of primaries: protons, heavy nuclei, relativistic dust grains. The data of Volcano Ranch for showers coming from different directions is treated according to the various theoretical hypothesis.

32633 **Effect of the earth's magnetic field in the large zenith angle EAS of superhigh energies.** Dyakonov, M.N.; Egorov, T.A.; Egorova, V.P. (Institute of Cosmophysical Research and Aeronomy, Yakutsk, (USSR)). pp 74-77 of Conference papers. 17. International cosmic ray conference, Paris. 13-25 July 1981. Vol. 6, EA Session. Paris, France; Commissariat a l'Energie Atomique (1981).

From 17. international cosmic ray conference; Paris, France (13 Jul 1981).

Effects of the Earth's magnetic field on the lateral distribution of particles in very inclined EAS of superhigh energy is considered. Preliminary results of analysis for 12 events of EAS with $E_0 > 10^{19}$eV observed under the zenith angle 67 < theta < 78° in the Yakutsk EAS array are presented.

32634 **Simulation of measurements at the Yakutsk complex EAS array.** Dyakonov, M.N.; Ivanov, A.A.; Knurenko, S.P. (Institute of Cosmophysical Research and Aeronomy, Yakutsk, (USSR)). pp 78-81 of Conference papers. 17. International cosmic ray conference, Paris, 13-25 July 1981. Vol. 6, EA Session. Paris, France; Commissariat a l'Energie Atomique (1981).

From 17. international cosmic ray conference; Paris, France (13 Jul 1981).

The simulation results of the measurements of flux densities of the particles rhosub(600) and of the atmospheric Cerenkov light Q_{600} at the Yakutsk EAS array are presented.

32635 **Frequency spectrum of radio emission from air showers.** McDonald, D.M.; Prescott, J.R. (Adelaide Univ. (Australia). Dept. of Physics). pp 82-85 of Conference papers. 17. International cosmic ray conference, Paris, 13-25 July 1981. Vol. 6, EA Session. Paris, France; Commissariat a l'Energie Atomique (1981).

From 17. international cosmic ray conference; Paris, France (13 Jul 1981).

The radio emission from showers of size greater than 2 x 10^6 particles has been studied at the frequencies 45, 75, 105 and 135 MHz. The spectrum is rather flat in this region with normalised field strength of approximately 1.7 $\mu Vm^{-1} MHz^{-1}$.

32636 **Atmospheric Cerenkov measurements of EAS.** Liebing, D.F.; Clay, R.W.; Gregory, A.G.; Patterson, J.R.; Prescott, J.R.; Thornton, G.J. (Adelaide Univ. (Australia). Dept. of Physics). pp 90-93 of Conference papers. 17. International cosmic ray conference, Paris, 13-25 July 1981. Vol. 6, EA Session. Paris, France; Commissariat a l'Energie Atomique (1981).

From 17. international cosmic ray conference; Paris, France (13 Jul 1981).

Simultaneous measurements on Cerenkov pulse profiles for individual EAS recorded with up to three wide band detectors have been used to estimate the radial power law dependence of the FWHM. A mean value of n = 1.5 +- 0.9 was obtained for seven showers for which two measurements are available and n = 1.46 +- 0.20 for one shower with three measurements.

32637 **Measurements of the Cerenkov light pulse duration at the Samarkand State University EAS array.** Khristiansen, G.B.; Kalmykov, N.N.; Prosin, V.V. (Moskovskij Gosudarstvennyj Univ. (USSR). Nauchno-Issledovatel'skij Inst. Yadernoj Fiziki); Aliev, S.A.; Alimov, N.N.; Kahharov, M.K.; Makhmudov, B.M.; Skvirenkov, S.V. (Samarkandskij Gosudarstvennyj Univ. (USSR)). pp 94 of Conference papers. 17. International cosmic ray conference, Paris, 13-25 July 1981. Vol. 6, EA Session. Paris, France; Commissariat a l'Energie Atomique (1981).

From 17. international cosmic ray conference; Paris, France (13 Jul 1981).

32638 **Experimental data on the lateral distribution of Cerenkov radiation from EAS.** Khristiansen, G.B.; Kalmykov, N.N. (Moskovskij Gosudarstvennyj Univ. (USSR). Nauchno-Issledovatel'skij Inst. Yadernoj Fiziki); Aliev, N.A.; Alimov, T.A.; Bagdasarian, S.; Kahharov, M.K.; Makhmudov, B.M. (Samarkandskij Gosudarstvennyj Univ. (USSR)). pp 95 of Conference papers. 17. International cosmic ray conference, Paris, 13-25 July 1981. Vol. 6, EA Session. Paris, France; Commissariat a l'Energie Atomique (1981).

From 17. international cosmic ray conference; Paris, France (13 Jul 1981).

32639 **Lateral distribution of atmospheric Cerenkov light.** Kuhlmann, J.D.; Clay, R.W. (Adelaide Univ. (Australia). Dept. of Physics). pp 96-99 of Conference papers. 17. International cosmic ray conference, Paris, 13-25 July 1981. Vol. 6, EA Session. Paris, France; Commissariat a l'Energie Atomique (1981).

From 17. international cosmic ray conference; Paris, France (13 Jul 1981).

The lateral distribution function of atmospheric Cerenkov radiation has been measured, using an array of detectors, for core distances < = approximately 300m. The dependence of this function on observed shower parameters is presented and discussed.

32640 **Atmospheric Cerenkov light from air showers above 10^{15} eV observed at 900m above sea level.** Inoue, N.; Sugawa, N.; Tamura, T.; Kakimoto, F.; Suga, K. (Tokyo Inst. of Tech. (Japan). Dept. of Physics); Nishi, K. (Institute of Physical and Chemical Research, Wako, Saitama (Japan)). pp 100 of Conference papers. 17. International cosmic ray conference, Paris, 13-25 July 1981. Vol. 6, EA Session. Paris, France; Commissariat a l'Energie Atomique (1981).

From 17. international cosmic ray conference; Paris, France (13 Jul 1981).

32641 **Atmospheric Cerenkov light from large air showers observed at 5200m above sea level.** Inoue, N.; Kakimoto, F.; Tamura, T. (Tokyo Inst. of Tech. (Japan). Dept. of Physics). pp 101 of Conference papers. 17. International cosmic ray conference, Paris, 13-25 July 1981. Vol. 6, EA Session. Paris, France; Commissariat a l'Energie Atomique (1981).

From 17. international cosmic ray conference; Paris, France (13 Jul 1981).

32642 **Observation of Cerenkov light at the distance of more than 1Km from the EAS core.** Hara, T.; Hayashida, N.; Jogo, N. (Tokyo Univ. (Japan)). pp 102 of Conference papers. 17. International cosmic ray conference, Paris, 13-25 July 1981. Vol. 6, EA Session. Paris, France; Commissariat a l'Energie Atomique (1981).

From 17. international cosmic ray conference; Paris, France (13 Jul 1981).

32643 Observation of EAS Cerenkov light reflected from mountain snow. Castagnoli, C.; Morello, C.; Navarra, G. (Consiglio Nazionale delle Ricerche, Turin (Italy). Lab. di Cosmo-Geofisica). pp 103-105 of Conference papers. 17. International cosmic ray conference, Paris, 13-25 July 1981. Vol. 6, EA Session. Paris, France; Commissariat a l'Energie Atomique (1981).

From 17. international cosmic ray conference; Paris, France (13 Jul 1981).

The observation of Cerenkov light from extensive air showers reflected from the ground snow can be very interesting in the study of the cosmic ray primary spectrum at high energies. In fact by such technique it would be possible: 1) to realize a large collecting area: 2) to detect a light signal proportional to the total amount of C.L. produced; 3) to reduce the fluctuations due to the showers angular distribution. On other side a large amount of signal is lost while the nightsky background is quite large; moreover it is necessary to run measurements in favourable sites or from balloon altitudes, and sum up results obtained in different nights and therefore with different atmospheric conditions. We discuss some preliminary results in the energy range between 10^{15} and 10^{16}eV and the sources of background and contamination.

32644 Drift of depth of EAS maximum development with primary energy 10^{18} + 10^{19}eV. Dyakonov, M.N.; Egorov, T.A.; Egorova, V.P. (Institute of Cosmophysical Research and Aeronomy, Yakutsk, (USSR)). pp 106-109 of Conference papers. 17. International cosmic ray conference, Paris, 13-25 July 1981. Vol. 6, EA Session. Paris, France; Commissariat a l'Energie Atomique (1981).

From 17. international cosmic ray conference; Paris, France (13 Jul 1981).

On measurement results of lateral distribution of EAS Cerenkov light flux density by method of inverse problem solution the average cascade curves of EAS electrons in energy range 10^{18} + 5.10^{18}eV were reconstructed. Drift (elongation) rate of shower development maximum depth ER = 90 +- 25 g.cm^{-2} per primary energy decade is obtained.

32645 Flux density fluctuations of the EAS atmospheric Cerenkov light with primary energy above 10^{17}eV. Dyakonov, M.N.; Knurenko, S.P.; Kozlov, V.I. (Institute of Cosmophysical Research and Aeronomy, Yakutsk, (USSR)). pp 110-113 of Conference papers. 17. International cosmic ray conference, Paris, 13-25 July 1981. Vol. 6, EA Session. Paris, France; Commissariat a l'Energie Atomique (1981).

From 17. international cosmic ray conference; Paris, France (13 Jul 1981).

Fluctuations of logarithm of ratio of Cerenkov light flux densities at two distances from shower core are considered. Fluctuations for shower development maximum depth values: deltaXsub(m) = 79 +- 4 g.cm^{-2} for E_0 = 7.5 . 10^{17}eV and deltaXsub(m) = 63 +- 5 g.cm^{-2} for E_0 = 4.0 . 10^{18}eV are obtained.

32646 Shape of EAS cascade curve at $E_0 > 10^{17}$eV. Kalmykov, N.N.; Nechin, Yu.A.; Prosin, V.V. (Moskovskij Gosudarstvennyj Univ. (USSR). Nauchno-Issledovatel'skij Inst. Yadernoj Fiziki). pp 114-117 of Conference papers. 17. International cosmic ray conference, Paris, 13-25 July 1981. Vol. 6, EA Session. Paris, France; Commissariat a l'Energie Atomique (1981).

From 17. international cosmic ray conference; Paris, France (13 Jul 1981).

The main results of this study is the found dependence of the altitude of EAS maximum on shower energy. At the same time, we have shown that the cascade curve of the development of individual EAS with $E_0 > 10^{17}$eV may in principle be represented by the shape of Cerenkov light pulse using the dependence relating the space coordinates of a point on EAS axis to the temporal parameters of Cerenkov pulse and the angular distribution of the EAS electrons emitting Cerenkov light.

32647 Separation of the charged particle and Cerenkov light components of large cosmic ray showers. Orford, K.J.; Stephenson, I.; Turver, K.E.; Walley, G.M. (Durham Univ. (UK)). pp 118-120 of Conference papers. 17. International cosmic ray conference, Paris, 13-25 July 1981. Vol. 6, EA Session. Paris, France; Commissariat a l'Energie Atomique (1981).

From 17. international cosmic ray conference; Paris, France (13 Jul 1981).

Measurements using 3 x 1 m^2 plastic scintillator detectors operated in an array of atmospheric Cerenkov light detectors are reported. The time separation of the arrival of the particles and light and the charged particle density have been measured in showers of energy 8 x 10^{15}-10^{17}eV at core distances in the range 30-300m. The sensitivity of these quantities to cascade development is discussed.

32648 Lateral distribution of Cerenkov light in cosmic ray showers. Chantler, M.P.; Craig, M.A.B.; McComb, T.J.L.; Orford, K.J.; Turver, K.E.; Walley, G.M. (Durham Univ. (UK)). pp 121-124 of Conference papers. 17. International cosmic ray conference, Paris, 13-25 July 1981. Vol. 6, EA Session. Paris, France; Commissariat a l'Energie Atomique (1981).

From 17. international cosmic ray conference; Paris, France (13 Jul 1981).

Measurements of the average lateral distribution of Cerenkov light in showers of energy 3 x 10^{16} - 5 x 10^{17}eV recorded by the Dugway Cerenkov light experiment are reported. The depths of electron cascade maximum derived from these lateral distributions are presented.

32649 Shape of Cerenkov light pulses as a measure of cascade development in large air showers. Andam, A.A.; Chantler, M.P.; Craig, M.A.B.; McComb, T.J.L.; Orford, K.J.; Turver, K.E.; Walley, G.M. (Durham Univ. (UK)). pp 125-128 of Conference papers. 17. International cosmic ray conference, Paris, 13-25 July 1981. Vol. 6, EA Session. Paris, France; Commissariat a l'Energie Atomique (1981).

From 17. international cosmic ray conference; Paris, France (13 Jul 1981).

Measurements of Cerenkov light pulses in showers of primary energy 10^{16} - 10^{17}eV recorded by the Dugway Cerenkov light array are reported. The pulse shapes are compared with simulations to provide an estimate of the average depth of shower maximum.

32650 Cosmic ray showers imaged in Cerenkov light. Andam, A.A.; Chantler, M.P.; Craig, M.A.B.; McComb, T.J.L.; Orford, K.J.; Turver, K.E.; Walley, G.M. (Durham Univ. (UK)). pp 129 of Conference papers. 17. International cosmic ray conference, Paris, 13-25 July 1981. Vol. 6, EA Session. Paris, France; Commissariat a l'Energie Atomique (1981).

From 17. international cosmic ray conference; Paris, France (13 Jul 1981).

32651 Computer simulations of atmosphere Cerenkov radiation in large cosmic ray showers. McComb, T.J.L.; Turver, K.E. (Durham Univ. (UK)). pp 130-133 of Conference papers. 17. International cosmic ray conference, Paris, 13-25 July 1981. Vol. 6, EA Session. Paris, France; Commissariat a l'Energie Atomique (1981).

From 17. international cosmic ray conference; Paris, France (13 Jul 1981).

The computations of Protheroe and Turver (1979) have been extended to include the Cerenkov light in showers incident at zenith angles up to 60°.

32652 Comparison of Cerenkov radiation pulse shapes calculated regarding and disregarding thickness and curvature of shower front. Galkin, V.I.; Ivanenko, I.P.; Makarov, V.V. (Moskovskij Gosudarstvennyj Univ. (USSR). Nauchno-Issledovatel'skij Inst. Yadernoj Fiziki). pp 134 of Conference papers. 17. International cosmic ray conference, Paris, 13-25 July 1981. Vol. 6, EA Session. Paris, France; Commissariat a l'Energie Atomique (1981).

From 17. international cosmic ray conference; Paris, France (13 Jul 1981).

32653 Simplified method of calculation of Cerenkov pulse height distribution from EAS. Pathak, K.M.; Boruah Kalyanee (Gauhati Univ. (India). Dept. of Physics). pp 136-139 of Conference papers. 17. International cosmic ray conference, Paris, 13-25 July 1981. Vol. 6, EA Session. Paris, France; Commissariat a l'Energie Atomique (1981).

From 17. international cosmic ray conference; Paris, France (13 Jul 1981).

A simplified method of calculating the average pulse height distribution of the optical Cerenkov radiation from large EAS has been developed. It has been shown that the average Cerenkov pulse height distribution at any point at the detector level may be obtained even without the precise knowledge of the location of the shower axis as well as the primary energy. A comparative study of the theoretical distribution thus derived has been made with the experimental data.

32654 Monte Carlo calculation of Cerenkov light from the extensive air shower. Jogo, N.; Tanahashi, G.; Tang, Y.H. (Tokyo Univ., Tanashi (Japan). Cosmic Ray Lab.); Misaki, A. (Saitama Univ., Urawa (Japan)). pp 140 of Conference papers. 17. International cosmic ray conference, Paris, 13-25 July 1981. Vol. 6, EA Session. Paris, France; Commissariat a l'Energie Atomique (1981).

From 17. international cosmic ray conference; Paris, France (13 Jul 1981).

32655 Calculated time characteristics of Cerenkov pulses from air showers. Hillas, A.M. (Leeds Univ. (UK). Dept. of Physics). pp 141 of Conference papers. 17. International cosmic ray conference, Paris, 13-25 July 1981. Vol. 6, EA Session. Paris, France; Commissariat a l'Energie Atomique (1981).

From 17. international cosmic ray conference; Paris, France (13 Jul 1981).

32656 X-ray photons in extensive air showers. Khristiansen, G.B.; Kulikov, G.V.; Nazarov, V.I.; Solovieva, V.I.; Fomin, Yu.A.; Charakhchyan, T.N. (Moskovskij Gosudarstvennyj Univ. (USSR). Nauchno-Issledovatel'skij Inst. Yadernoj Fiziki); Bazilevskaya, G.A.; Charakhchyan, A.N. (FIAN, Moscow, (USSR)). pp 142-145 of Conference papers. 17. International cosmic ray conference, Paris, 13-25 July 1981. Vol. 6, EA Session. Paris, France; Commissariat a l'Energie Atomique (1981).

From 17. international cosmic ray conference; Paris, France (13 Jul 1981).

The results of the study of X-ray photons in EAS using the complex EAS array of the Moscow State University are presented. The photon-to-electron density ratio has been obtained as a function of the distance to EAS axis.

32657 Usage of small EAS with Nsub(e) approximately 10^4 at mountains for the calibration of the interaction model. Danilova, T.V.; Erlykin, A.D.; Machavariani, S.K. (AN SSSR, Moscow. Fizicheskij Inst.). pp 146-149 of Conference papers. 17. International cosmic ray conference, Paris, 13-25 July 1981. Vol. 6, EA Session. Paris, France; Commissariat a l'Energie Atomique (1981).

From 17. international cosmic ray conference; Paris, France (13 Jul 1981).

The comparison of experimental data on small EAS with calculations based on the extrapolations from 10^{12} eV-region to above 10^{13} eV is presented.

32658 Study of EAS development. Miyake, S. (Institute for Cosmic Ray Research, Tokyo, (Japan)); Kawakami, S. (Osaka City Univ. (Japan). Faculty of Science). pp 150 of Conference papers. 17. International cosmic ray conference, Paris, 13-25 July 1981. Vol. 6, EA Session. Paris, France; Commissariat a l'Energie Atomique (1981).

From 17. international cosmic ray conference; Paris, France (13 Jul 1981).

32659 Study of the age parameter of extensive air showers observed at sea level. Abdullah, M.M.; Ashton, F.; Fatemi, J. (Durham Univ. (UK)). pp 151-154 of Conference papers. 17. International cosmic ray conference, Paris, 13-25 July 1981. Vol. 6, EA Session. Paris, France; Commissariat a l'Energie Atomique (1981).

From 17. international cosmic ray conference; Paris, France (13 Jul 1981).

Evidence is presented that the average age parameter of extensive air showers observed at sea level increases significantly for showers of size $> 5.10^6$ particles.

32660 Fluctuations of the muon and electron lateral distributions in extensive air showers. Dzikowski, T.; Gawin, J.; Grochalska, B.; Pachala, S. (Lodz Univ. (Poland)). pp 155 of Conference papers. 17. International cosmic ray conference, Paris, 13-25 July 1981. Vol. 6, EA Session. Paris, France; Commissariat a l'Energie Atomique (1981).

From 17. international cosmic ray conference; Paris, France (13 Jul 1981).

32661 Phenomenological characteristics of the muon and electron components of extensive air showers with sizes 10^6-10^7 at mountain altitude. Abdrashitov, S.F.; Bjurina, T.A.; Vavilov, Y.N. (AN SSSR, Moscow. Fizicheskij Inst.). pp 156-159 of Conference papers. 17. International cosmic ray conference, Paris, 13-25 July 1981. Vol. 6, EA Session. Paris, France; Commissariat a l'Energie Atomique (1981).

From 17. international cosmic ray conference; Paris, France (13 Jul 1981).

New experimental results about the lateral distributions of muon and electron fluxes in EAS, registrated from the Tien Shan array during the effective running time approximately 10^4h, were analysed on the base of recent model calculations.

32662 Detailed examination of the electron lateral energy and density near the core of medium energy air showers. Green, P.J.; Denton, B.A. (Texas A and M Univ., College Station (USA). Dept. of Physics). pp 160 of Conference papers. 17. International cosmic ray conference, Paris, 13-25 July 1981. Vol. 6, EA Session. Paris, France; Commissariat a l'Energie Atomique (1981).

From 17. international cosmic ray conference; Paris, France (13 Jul 1981).

32663 Observation of hadronic components and muons in EAS at mountain altitude. Miyake, S. (Institute for Cosmic Ray Research, Tokyo, (Japan)). pp 161 of Conference papers. 17. International cosmic ray conference, Paris, 13-25 July 1981. Vol. 6, EA Session. Paris, France; Commissariat a l'Energie Atomique (1981).

From 17. international cosmic ray conference; Paris, France (13 Jul 1981).

32664 Size spectra and anisotropy measurements with the Buckland Park array. Gerhardy, P.R.; Clay, R.W.; Gregory, A.G.; Liebing, D.F.; Patterson, J.R.; Prescott, J.R. (Adelaide Univ. (Australia). Dept. of Physics). pp 162 of Conference papers. 17. International cosmic ray conference, Paris, 13-25 July 1981. Vol. 6, EA Session. Paris, France; Commissariat a l'Energie Atomique (1981).

From 17. international cosmic ray conference; Paris, France (13 Jul 1981).

32665 Arrival time distribution of electron components near the air shower core at Akeno. Sakuyama, H.; Suzuki, N. (Meisei Univ., Hino, Tokyo (Japan). Faculty of Science and Technology). pp 163 of Conference papers. 17. International cosmic ray conference, Paris, 13-25 July 1981. Vol. 6, EA Session. Paris, France; Commissariat a l'Energie Atomique (1981).

From 17. international cosmic ray conference; Paris, France (13 Jul 1981).

32666 Time delay distribution of high energy muons in the EAS. Grishina, N.V.; Kalmykov, N.N. (Moskovskij Gosudarstvennyj Univ. (USSR). Nauchno-Issledovatel'skij Inst. Yadernoj Fiziki). pp 164-167 of Conference papers. 17. International cosmic ray conference, Paris, 13-25 July 1981. Vol. 6, EA Session. Paris, France; Commissariat a l'Energie Atomique (1981).

From 17. international cosmic ray conference; Paris, France (13 Jul 1981).

One of the experimentally measured characteristics of the extensive air shower (EAS) is the time delays of particles with respect to the arrival time of the shower front, in particular, the muon time delay. The study of the arrival time distribution of low energy (< 1 GeV) muons at the Havera Part array permitted a number of important conclusions concerning the EAS longitudinal development. The present paper treats the high energy (> 5 GeV) muon time delays. These muons can be experimentally studied at the Moscow State University EAS complex array. Knowledge of the muon time delay distribution is also needed for performing the experiments aimed at searching for particles of mass approximately 10 GeV whose existence is in line with the current theoretical notions.

32667 SYS air shower experiment at Mt. Chacaltaya. Matano, T.; Machida, M.; Ohta, K. (Saitama Univ., Urawa (Japan). Dept. of Physics). pp 168 of Conference papers. 17. International cosmic ray conference, Paris, 13-25 July 1981. Vol. 6, EA Session. Paris, France; Commissariat a l'Energie Atomique (1981).

From 17. international cosmic ray conference; Paris, France (13 Jul 1981).

32668 Air shower cores observed with emulsion chambers combined with the air shower array at Mt. Chacaltaya. Matano, T.; Machida, M.; Ohta, K. (Saitama Univ., Urawa (Japan). Dept. of Physics). pp 169 of Conference papers. 17. International cosmic ray conference, Paris, 13-25 July 1981. Vol. 6, EA Session. Paris, France; Commissariat a l'Energie Atomique (1981).

From 17. international cosmic ray conference; Paris, France (13 Jul 1981).

32669 Core structure studied with the lattice air shower detectors at Mt. Chacaltaya. Matano, T.; Machida, M.; Ohta, K. (Saitama Univ., Urawa (Japan). Dept. of Physics). pp 170 of Conference papers. 17. International cosmic ray conference, Paris, 13-25 July 1981. Vol. 6, EA Session. Paris, France; Commissariat a l'Energie Atomique (1981).

From 17. international cosmic ray conference; Paris, France (13 Jul 1981).

32670 Spark chamber study of subcores at mountain altitude. Hazen, W.E.; Hendel, A.Z.; Hazen, E.S. (Michigan Univ., Ann Arbor (USA). Randall Lab. of Physics). pp 171 of Conference papers. 17. International cosmic ray conference, Paris, 13-25 July 1981. Vol. 6, EA Session. Paris, France; Commissariat a l'Energie Atomique (1981).

From 17. international cosmic ray conference; Paris, France (13 Jul 1981).

32671 Size dependence of the average transverse momentum of hadrons with respect to the shower axis direction in extensive air showers observed at sea level. Ashton, F.; Nejabat, H. (Durham Univ. (UK)). pp 172-175 of Conference papers. 17. International cosmic ray conference, Paris, 13-25 July 1981. Vol. 6, EA Session. Paris, France; Commissariat a l'Energie Atomique (1981).

From 17. international cosmic ray conference; Paris, France (13 Jul 1981).

Contrary to expectation the average transverse momentum of hadrons with respect to the shower axis direction is found to increase with shower size. The results indicate a change in the character of the nucleon-nucleon interaction for energies $> 2.10^{14}$ eV.

32672 Measurements of electron densities in E.A.S. using spark chambers and thin scintillators. Hazen, W.E.; Hendel, A.Z. (Michigan Univ., Ann Arbor (USA). Dept. of Physics); Ash, A.G.; Foster, J.M.; Hodson, A.L.; Porter, M.R. (Leeds Univ. (UK). Dept. of Physics); Bull, R.M. (Nottingham Univ. (UK)). pp 176 of Conference papers. 17. International cosmic ray conference, Paris, 13-25 July 1981. Vol. 6, EA Session. Paris, France; Commissariat a l'Energie Atomique (1981).

From 17. international cosmic ray conference; Paris, France (13 Jul 1981).

32673 Study of the air-shower response of current-limited spark chambers and scintillators. Porter, M.R.; Hodson, A.L. (Leeds Univ. (UK). Dept. of Physics); Bull, R.M. (Nottingham Univ. (UK)). pp 177 of Conference papers. 17. International cosmic ray conference, Paris, 13-25 July 1981. Vol. 6, EA Session. Paris, France; Commissariat a l'Energie Atomique (1981).

From 17. international cosmic ray conference; Paris, France (13 Jul 1981).

32674 Evaluation of systematic errors affecting measurements of radial distributions of particles or subcores about air shower axes. Foster, J.M. (Leeds Univ. (UK). Dept. of Physics). pp 178-181 of Conference papers. 17. International cosmic ray conference, Paris, 13-25 July 1981. Vol. 6, EA Session. Paris, France; Commissariat a l'Energie Atomique (1981).

From 17. international cosmic ray conference; Paris, France (13 Jul 1981).

In many cosmic ray experiments it is desired to measure the distribution of hadrons, muons, gamma-rays or subcores about air shower axes with as much accuracy as possible. Account must be taken of systematic errors, usually arising from uncertainty in the axis position, coupled with rather steep radial distributions. This paper describes some techniques which may be used, together with simplifying assumptions, to estimate these errors in cases where a complete simulation of the detector array response is felt to be either unnecessary or not possible.

32675 Simulations of the longitudinal development and lateral distribution of electrons in extensive air showers. Ash, A.G. (Leeds Univ. (UK). Dept. of Physics). pp 182 of Conference papers. 17. International cosmic ray conference, Paris, 13-25 July 1981. Vol. 6, EA Session. Paris, France; Commissariat a l'Energie Atomique (1981).

From 17. international cosmic ray conference; Paris, France (13 Jul 1981).

32676 Data on multicore air showers and cross-section of high-transverse momentum jets production at $\sqrt{S}$ approximately 500 GeV. Chudakov, A.E.; Lidvansky, A.S.; Tizengauzen, V.A. (AN SSSR, Moscow. Fizicheskij Inst.); Dobrzynski, K.; Krys, E. (Lodz Univ. (Poland)); Wdowczyk, E. (Institute for Nuclear Research (Poland)); Navarra, G. (Institute of Cosmogeophysics (Italy)). pp 183-186 of Conference papers. 17. International cosmic ray conference, Paris, 13-25 July 1981. Vol. 6, EA Session. Paris, France; Commissariat a l'Energie Atomique (1981).

From 17. international cosmic ray conference; Paris, France (13 Jul 1981).

Further analysis of multicore events observed at Baksan Air shower array is presented. After Monte Carlo calculations of transition effect we have changed the scale of subcores transverse momenta. As a result, now maximum value of psub(T) hardly exceed 10 GeV/c. Cross-section of jet production as well as inclusive cross-section for pions have been estimated and compared to extrapolation of experimental data and theoretical expectations. While extrapolation of measured at ISR cross-section leads to vast disagreement with cross-section of air shower p'sub(T)s, the last one, however uncertain, is in surprising agreement with QCD predictions.

32677 **Energy flow of extensive air showers.** Asakimori, K.; Maeda, T. ; Kameda, T.; Mizushima, K. pp 187-190 of Conference papers. 17. International cosmic ray conference, Paris, 13-25 July 1981. Vol. 6, EA Session. Paris, France; Commissariat a l'Energie Atomique (1981).

From 17. international cosmic ray conference; Paris, France (13 Jul 1981).

Fluctuation of energy flow near the core of EAS was studied in connection with the size and the age parameter of EAS. EAS with size 10^5 - 2 x 10^5 have larger fluctuation of energy flow than that expected statistically from EAS with size $> = 2 \times 10^5$. The former EAS are classified into two groups, that is, those having smaller energy flow and larger s (age parameter), and others having larger energy flow and smaller s. Meanwhile, in EAS with size $> = 2 \times 10^5$ fluctuation of energy flow decreases with increasing size, and the proportion of EAS which correspond to the latter group of EAS with size 10^5 - 2 x 10^5 increases. These results seem to reflect a possible change of the chemical composition of primary cosmic rays near 2 x 10^6 GeV.

32678 **Energy flow of air shower cores in Akeno.** Matano, T.; Machida, M. (Saitama Univ., Urawa (Japan). Dept. of Physics). pp 191 of Conference papers. 17. International cosmic ray conference, Paris, 13-25 July 1981. Vol. 6, EA Session. Paris, France; Commissariat a l'Energie Atomique (1981).

From 17. international cosmic ray conference; Paris, France (13 Jul 1981).

32679 **Observations of stellar winds in early type stars.** Conti, P.S. (Joint Inst. for Lab. Astrophysics, Boulder, CO (USA)). pp 1-18 of Effects of mass loss on stellar evolution. Chiosi, C. (Padua Univ. (Italy). Ist. di Astronomia); Stalio, R. (Osservatorio Astronomico, Trieste (Italy)) (eds.). Dordrecht, Netherlands; D. Reidel (1981).

From IAU colloquium 59 on effects of mass-loss of stellar evolution; Trieste, Italy (15 Sep 1980).

The author reviews the 'observations' of winds in early-type stars and concentrates on the massive population I stars of these types, and primarily the O and WR classes on which most of the recent work has been done. The early B type supergiants share many of the wind properties of the O stars but the later supergiant types, Be stars, and main sequence stars may not. Stellar winds are a ubiquitous phenomenon among these early type stars. Evidence of their winds is seen in the resonance line P Cygni profiles in the UV region, in the emission lines of Hα and lambda4686 He II in the optical spectrum, and in the free-free emission from the ionized plasma as observed in the IR and radio regions of the spectrum.

32680 **Dependence of mass loss on the basic stellar parameters.** Lamers, H.J.G.L.M. (Rijksuniversiteit Utrecht (Netherlands). Lab. voor Ruimte-Onderzoek). pp 19-25 of Effects of mass loss on stellar evolution. Chiosi, C. (Padua Univ. (Italy). Ist. di Astronomia); Stalio, R. (Osservatorio Astronomico, Trieste (Italy)) (eds.). Dordrecht, Netherlands; D. Reidel (1981).

From IAU colloquium 59 on effects of mass-loss of stellar evolution; Trieste, Italy (15 Sep 1980).

The author has determined the dependence of mass loss on the stellar parameters for O and B stars of various luminosities. Four homogeneous sets of mass loss rates derived by different authors from the radio flux, the infrared excess, the UV lines and Hα emission are used. As the rates derived from the radio flux are the least dependent on model assumptions for the stellar wind, these are adopted as the standards. The others sets of mass loss rates are corrected for the differences in the adopted wind model, especially in the velocity law, by scaling the rates to those derived from radio data, using the stars which the different sets have in common.

32681 **Velocity characteristics of WR stellar winds.** Willis, A.J. (University Coll., London (UK). Dept. of Physics and Astronomy). pp 27-33 of Effects of mass loss on stellar evolution. Chiosi, C. (Padua Univ. (Italy). Ist. di Astronomia); Stalio, R. (Osservatorio Astronomico, Trieste (Italy)) (eds.). Dordrecht, Netherlands; D. Reidel (1981).

From IAU colloquium 59 on effects of mass-loss of stellar evolution; Trieste, Italy (15 Sep 1980).

This paper briefly reports a first analysis of the UV (and visible) P-Cygni profiles observed in 10 WR stars. The UV spectroscopy was obtained using the high resolution IUE mode (Δlambda approximately 0.1-0.2A) in the wavelength range 1150-3250. Details of the programme stars are given. All the IUE spectra were extracted and reduced using programmes developed at UCL which provide good echelle-interorder background subtraction, accurate tracking of the often distorted individual order spectra, and improved echelle-blaze correction.

32682 **Iron curtain of the WC9 star HD 164270.** van der Hucht, K.A. (Rijksuniversiteit Utrecht (Netherlands). Lab. voor Ruimte-Onderzoek); Conti, P.S. (Joint Inst. for Lab. Astrophysics, Boulder, CO (USA)). pp 35-37 of Effects of mass loss on stellar evolution. Chiosi, C. (Padua Univ. (Italy). Ist. di Astronomia); Stalio, R. (Osservatorio Astronomico, Trieste (Italy)) (eds.). Dordrecht, Netherlands; D. Reidel (1981).

From IAU colloquium 59 on effects of mass-loss of stellar evolution; Trieste, Italy (15 Sep 1980).

The emission lines in the optical and UV spectrum of the WC9 star HD 164270 indicate a terminal velocity of its wind of vsub(infinity) approximately 1400 km s^{-1}. In the UV spectrum Fe III absorption lines appear from transitions with metastable lower levels. Because they are displayed over only 830 km s^{-1}, it is suggested that they are formed in the decelerating part of the wind. A radius of 1.8 x 10^4 solar radii is found for the circumstellar Fe III shell. This value is within the range of radii calculated by Cohen et al. (1975) for the dust shells of WC9 stars.

32683 **Binary system as a hidden source of high energy neutrinos.** Berezinski, V.S.; Prilutski, O.F. (AN SSSR, Moscow. Inst. Yadernykh Issledovanij). pp 168-171 of Conference papers. 17. International cosmic ray conference, Paris, 13-25 July 1981. Vol. 7, MN Session. Paris, France; Commissariat a l'Energie Atomique (1981).

From 17. international cosmic ray conference; Paris, France (13 Jul 1981).

A binary system comprised of a pulsar and a core of supergiant both being surrounded by the massive envelope is studied. The cosmic rays accelerated by the pulsar produce in the envelope high energy neutrinos as a result of nuclear collisions. Gamma and x-rays originated in the same collisions are thermalized in the envelope, so when viewed externally in any kind of electromagnetic radiation the source looks like the usual supergiant.

32684 **Monte Carlo study of neutrino acceleration in supernova shocks.** Kazanas, D. (National Aeronautics and Space Administration, Greenbelt, MD (USA). Goddard Space Flight Center); Ellison, D.C. (Catholic Univ. of America, Washington, DC. Dept. of Space Science and Applied Physics; National Aeronautics and Space Administration, Greenbelt, MD (USA). Goddard Space Flight Center). pp 176-179 of Conference papers. 17. International cosmic ray conference, Paris, 13-25 July 1981. Vol. 7, MN Session. Paris, France; Commissariat a l'Energie Atomique (1981).

From 17. international cosmic ray conference; Paris, France (13 Jul 1981).

The first order Fermi acceleration mechanism of cosmic rays in shocks may be at work for neutrinos in supernova shocks when the latter are at densities rho$> 10^{13}$ g cm^{-3} at which the core material is opaque to neutrinos. A Monte Carlo approach to study this

effect is employed and the emerging neutrino power law spectra are presented. The increased energy acquired by the neutrinos may facilitate their detection in supernova explosions and provide information about the physics of collapse.

32685 **Correlation of the high energy muons with the size of the air showers associated.** Higaski, S.; Kajino, F.; Nakashita, M.; Ozaki, S.; Takahashi, T.; Yamamoto, S. (Osaka City Univ. (Japan). Dept. of Physics). pp 191 of Conference papers. 17. International cosmic ray conference, Paris 13-25 July 1981. Vol. 7, MN Session. Paris, France; Commissariat a l'Energie Atomique (1981).

From 17. international cosmic ray conference; Paris, France (13 Jul 1981).

32686 **Detection of heavy nuclei in the plastic track detector CR-39.** Fumuro, F.; Ihara, R. (Osaka City Univ. (Japan)); Ohta, I. (Utsunomiya University, (Japan)). pp 102 of Conference papers. 17. International cosmic ray conference, Paris, 13-25 July 1981. Vol. 5, HE Session. Paris, France; Commissariat a l'Energie Atomique (1981).

From 17. international cosmic ray conference; Paris, France (13 Jul 1981).

32687 **Synthesis of life related molecules in interstellar space.** Ghosh, K.K.; Ghosh, S.N. (Calcutta Univ. (India). Dept. of Applied Physics). pp 110-116 of Proceedings of the workshop on origin and evolution of life and intelligence in the universe held at Bombay [during] January 14-16, 1980. Chadha, M.S.; Chitre, S.M.; Daniel, R.R. (eds.). Bangalore, India; Indian Space Research Organisation (1980).

From Workshop on origin and evolution of life and intelligence in the universe; Bombay, India (14 Jan 1980).

Two-body gas phase ion-neutral reactions have been proposed to explain the formation of organic molecules such as methylamine, methyl alcohol and formic acid. These molecules have been detected in the denser regions of dark clouds in the interstellar space. The formation process in each case is discussed.

6403 Atomic, Molecular, And Chemical Physics

REFER ALSO TO CITATION(S) 32164, 32810, 32909

32688 **(AERE-R—9986) Rydberg atoms.** Greenland, P.T. (UKAEA Atomic Energy Research Establishment, Harwell. Theoretical Physics Div.). Jun 1981. 35p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE82700074.

This report discusses the major features of Rydberg states in atoms. Particular emphasis is laid on the dipole matrix element for transitions from Rydberg to core states and analytic formulae for dipole matrix elements are obtained. These formulae are checked against the known matrix elements in alkali metal isoelectronic sequences. The formalism is extended to complex atoms where U serves as an example, and it is found that perturbation of Rydberg series by valence states is important. A nomogram for the calculation of Rydberg to core dipole matrix elements, field ionization thresholds and ionization rates is constructed.

32689 **(AERE-TP—876) Electron capture by highly stripped ions.** Greenland, P.T. (UKAEA Atomic Energy Research Establishment, Harwell. Theoretical Physics Div.). Jun 1981. 216p. NTIS (US Sales Only), PC A10/MF A01. Order Number DE82700075.

This review describes theories of electron capture suitable for the description of rearrangement collisions between atomic hydrogen and completely stripped projectiles with charge greater than unity. The region of impact velocity considered lies between 0.05 and 3 au, which is of technological importance in fusion power devices. The semiclassical, impact parameter formalism is discussed and the use of atomic expansions at medium impact velocity is described. Experimental results for both completely and partially stripped projectiles are reviewed. The use of a molecular basis at low energy, and the role of pseudocrossings peculiar to the two centre Coulomb interaction are described. Finally, purely classical techniques, in which the electron wavefunction is represented by an ensemble of Kepler orbits are considered. The review was completed in February 1981.

32690 **(CBPF-A—0004/80) Electronic structure and Moessbauer isomer shift of the iron atom isolated in crystalline argon matrix.** Braga, M.; Riego, A.R.; Danon, J. (Centro Brasileiro de Pesquisas Fisicas, Rio de Janeiro). Jan 1980. 22p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700082.

Multiple Scattering calculations were performed on an $FeAr_{12}$ cluster in order to describe the iron atom trapped in a crystalline argon matrix. The total electron densities at the iron nucleus derived from these calculations are used to interpret Moessbauer Isomer Shift data. The different bonding mechanisms contributing to the metal atom-rare gas matrix interaction are also investigated. The overlap distorsion effect of the metal wave functions is found to play a major role in the calculated electron densities. The iron isomer shift calibration constant was found to be -0.22 a^3 sub(o) mm sec^{-1}.

32691 **(CBPF-A—0005/80) Convergence problems and energetic regions in π excited states of certain conjugated molecules.** de Giambiagi, M.S.; Giambiagi, M.; de Barros, H.G.deP.L. (Centro Brasileiro de Pesquisas Fisicas, Rio de Janeiro). Jan 1980. 23p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700076.

When calculating π bond orders of excited and superexcited states of conjugated molecules, difficulties arise in applying the variation method; besides, the convergence problems involved are well known. For pyridazine, chosen for discussion, 27 states are considered; the convergence problem is envisaged through two criteria in the choice of a parameter introduced in the compromise Hamiltonian. This convergence parameter is related to the variation method. There exist three particular solutions for bond orders, which divide the 27 states into energetical regions.

32692 **(CBPF-A—0007/80) Magnetic behavior of Van Vleck ions and an electron gas interacting by exchange.** Palermo, L.; da Silva, X.A. (Centro Brasileiro de Pesquisas Fisicas, Rio de Janeiro). Jan 1980. 26p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE82700083.

The magnetic behavior of a model in which Van Vleck ions, under the action of a crystal field, interacting by exchange with an electron gas is investigated. The condition of onset of ferromagnetism and the behavior of the critical temperature, band and ionic magnetizations (and susceptibilities) versus temperature, as a function of the band width, exchange interaction and the crystal field splitting energy parameters are obtained within an approximation equivalent to a molecular field formulation.

32693 **(DOE/ER/02640—13) Reactions of ions with atomic and molecular free radicals. Progress report, May 1, 1981-April 30, 1982.** Gentry, W.R. (Minnesota Univ., Minneapolis (USA)). Nov 1981. Contract AS02-76ER02640. 7p. NTIS, PC A02/MF A01. Order Number DE82006890.

Analysis and interpretation of the data on the reactions of H_3^+ with N, C, O and F were completed, along with some supplementary investigations of collision-induced dissociation of the exotic species NH_3^{2+} and CS_2^{2+}. As the focus of this project shifts to other systems and phenomena, construction of a new crossed, pulsed molecular beam apparatus has been begun, and is now about 75% complete. The new instrument will permit state-resolved studies of energy transfer and reactive processes to be carried out with unprecendented sensitivity.

32694 **(DOE/ER/02892—29) Photoionization of helium to $He^+(n = 2)$.** Woodruff, P.R.; Samson, J.A.R. (Nebraska Univ., Lincoln (USA). Behlen Lab. of Physics; Wisconsin Univ., Stoughton (USA). Synchrotron Radiation Center). 1980. Contract AS02-76ER02892. 3p. (CONF-800626—9). NTIS, PC A02/MF A01. Order Number DE82007541.

From 6. international conference on vacuum ultraviolet radiation physics; Charlottesville, VA, USA (2 Jun 1980).

Measurement of the cross section for the simultaneous ionization and excitation of helium to the n = 2 level of He^+ is reported. (WHK)

32695 **(DOE/ER/02892—30) Photoionization of atoms. Final report, April 1, 1976-March 30, 1981.** Samson, J.A.R.; Starace, A.F. (Nebraska Univ., Lincoln (USA)). Nov 1981. Contract AS02-76ER02892. 29p. (COO—2892-30). NTIS, PC A03/MF A01. Order Number DE82006896.

There were two main goals in the experimental study of photoionization. One was to provide accurate data on the results of photon-atom collisions, studying the absolute probability for ejecting electrons from specific orbitals and determining their angular distributions. Also of interest was the probability for one photon to eject two or more electrons. Another goal was to make measurements of specific interactions that would provide sensitive tests for the various theoretical approximations used in calculating photoionization cross sections. To achieve these two goals, care was taken in the selection of the various experiments and in the use of the most appropriate and sophisticated equipment. For example, the techniques of Photoelectron Spectroscopy, Photoionization - Mass Spectrometry, and Synchrotron radiation were used in many of the experiments.

32696 **(DOE/ET/53025—T10) Collisional processes of interest in MFE plasma research. Annual report, October 1, 1980-September 30, 1981.** Olson, R.E. (SRI International, Menlo Park, CA (USA)). 15 Oct 1981. Contract AT03-76ET53025. 28p. (MP—81-174). NTIS, PC A03/MF A01. Order Number DE82002137.

Research on this contract can be divided into two general topics: (1) D^- formation collision processes, and (2) the determination of scattering cross sections used to diagnose properties of magnetically-confined plasmas. For topic (1) during last year, we completed theoretical calculations on the differential (angular) scattering of H^0 and D^0 on Cs, and determined the mechanisms and trends in the electron detachment cross sections for collisions of H^- and D^- on He, Ne, and the alkali and heavy alkaline earth atom systems. On topic (2) a major accomplishment was the determination of the electron capture and ionization cross sections for the C^{5+}, N^{5+}, and O^{5+} + H systems in the energy range from 13 eV/amu to 2.1 MeV/amu.

32697 **(DOE/EV/04500—2) Study of photoexcited states by positron method. Final report.** (New York Univ., NY (USA). Dept. of Physics). 1981. Contract AS02-77EV04500. 4p. NTIS, PC A02/MF A01. Order Number DE82005469.

Positrons can be used as markers in microscopic studies of molecular systems. This is so because positrons, as antiparticles of electrons, will annihilate with an electron in the medium under conditions that signify the electron density and momenta at the site of the positron. In most insulators, positrons can capture an electron into a stable atomic state before annihilation called positronium (Ps). Positronium, when formed, is a particularly powerful probe of materials since Ps annihilates in distinct ways from free positrons. It also has two different spin states which can be perturbed by paramagnetic centers in the medium and, thereby, measure their concentration and properties. This aspect of low-energy positron physics was taken advantage of for the study of light-excited electronic states in organic molecules. Long-lived triplet states, which normally yield phosphorescent luminescence on deexcitation, are particularly interesting. The triplet state has long been the subject of speculation as to its role in biology, the transmission of information, distribution of photo and radiation effects, etc. It was the object of this project to assess the potential of the positron method for the detection of trace concentrations of photo-induced triplet states of organic molecules. Progress is discussed. (WHK)

32698 (IA—1364, pp 9-10) **Classical reactive infinite order sudden approximation. Theory.** Jellinek, J. (Weizmann Inst. of Science, Rehovoth (Israel)); Baer, M. (Israel Atomic Energy Commission, Tel Aviv). Jul 1981. NTIS (US Sales Only), PC A13/MF A01.

In Research laboratories annual report 1980.

32699 (IA—1364, pp 81-82) **Application of metal vapor lasers to Raman spectroscopy for flame diagnostics.** Glatt, I.; Smilanski, I.; Bar-Ziv, E. Jul 1981. NTIS (US Sales Only), PC A13/MF A01.

In Research laboratories annual report 1980.

32700 (IA—1364, pp 90) **Moessbauer effect studies of Npsub(x)Pusub(1-x) (0.15<=x<=1) dihydrides.** Mintz, M.H.; Atzmony, U.; Fredo, S.; Gal, J. (Israel Atomic Energy Commission, Tel Aviv); Hadari, Z. (Ben-Gurion Univ. of the Negev, Beersheba (Israel)). Jul 1981. NTIS (US Sales Only), PC A13/MF A01.

In Research laboratories annual report 1980.

32701 (IA—1364, pp 71) **Study of the ion-molecule reaction in a microwave plasma of propylene.** Carmi, U. Jul 1981. NTIS (US Sales Only), PC A13/MF A01.

Thesis (Ph.D.).

In Research laboratories annual report 1980.

32702 **(IPPJ-AM—13) Proceedings of the Nagoya seminar on atomic processes in fusion plasmas.** Itikawa, Y.; Kato, T. (eds.). (Nagoya Univ. (Japan). Inst. of Plasma Physics). 1980. 79p. (CONF-7909240—). NTIS (US Sales Only), PC A05/MF A01. Order Number DE82780208.

From Nagoya seminar on atomic processes in fusion plasmas; Nagoya, Japan (5 Sep 1979).

Individual items from the seminar were prepared separately for the data base. (GHT)

32703 **(IPPJ-AM—15) Cross sections for charge transfer collisions involving hydrogen atoms.** Kaneko, Y.; Arikawa, T.; Itikawa, Y. (Nagoya Univ. (Japan). Inst. of Plasma Physics). Oct 1980. 184p. NTIS (US Sales Only), PC A09/MF A01. Order Number DE82700078.

Experimental data on the cross section for H + X sup(q+) → H^+ + X sup((q-1)+) are compiled for any element X and charge state q. The result is shown in graphs as a function of collision energy. A scaling law for the cross section is derived theoretically to provide quantitative information for highly-stripped ions for which no data are available. Cross sections for some related processes are also shown.

32704 **(JAERI-M—9310) Ionization cross sections for ion-atom and ion-molecule collisions, 1. Ionization cross sections for H^+, H_2^+, H_3^+, He^+ and He^{++} incident on H, H_2 and He.** Sataka, M.; Shirai, T.; Kikuchi, A.; Nakai, Y. (Japan Atomic Energy Research Inst., Tokyo). Feb 1981. 65p. NTIS (US Sales Only), PC A04/MF A01. Order Number DE82700079.

A survey has been made systematically of the literature up to the end of 1980. A compilation is presented of experimental ionization cross sections in graphs and tables together with a list of references.

32705 **(JINR—E-7-12219) Statistical limits for the unfolding of closely overlapping peaks in the X-ray spectrum analysis.** Muller, G.; Lehmann, D.; Musiol, G.; Zschornack, G. (Joint Inst. for Nuclear Research, Dubna (USSR)). 1979. 13p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700080.

The conditional number of the linear equation system for the unfolding of maximum 5 overlapping peaks with well-known positions was computed. The peaks were simulated not only by a Gaussian function but also by a more realistic function constructed with a random generator. Using the conditional number, the statistics and the area of the compound peak needed for good unfolding were evaluated. The chance of failure is increased by smoothing the compound peak.

32706 **(JINR-R—4-81-72) Possible effect of strong interaction on mesic molecule systems properties.** Belyaev, V.B.; Brener, S.E.; Gandyl, E.M.; Zubarev, A.L.; Irgaziev, B.F. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics). 1981. 7p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700081.

Alternative method of parametrization - a model of boundary conditions is considered. Adequate method of describing the physical system under consideration based on two-channel equations is applied as well. It is shown that the account for the strong dT interaction in mesic molecule $dT\mu$ can lead to the production of a new state with the energy E=Esub(R)-iGITAinto account the coupling between the elastic channel $dT\mu^- \rightarrow dT\mu^-$ and the $dT\mu^- \rightarrow {}^4He+n+\mu$, reaction channel, the possibility of emission from these states of hard μ-mesons with the energy considerably exceeding the characteristic mesic atom energies is established.

32707 **(JINR-R—17-80-814) Fokker-Planck equation for the description of thermalization of beams of energetic charged particle channeled through a crystal.** Gavrilenko, G.M.; Mikhalake, D.; Fedyanin, V.K. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics). 1980. 14p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700098.

A Fokker-Plank-type equation is derived in the second order perturbation theory for the density matrix, which describes the time evolution of a single particle system (proton or ion) weakly interacting with a large system (crystal). This equation is suitable for the description of the motion of fast particles channeled through crystals. In the case of planar channeling it is shown that the average transverse energy of the particle exponentially decreases with the penetration depth.

32708 **(KFTI—80-46) Physical experiment technique.** (AN Ukrainskoj SSR, Kharkov. Fiziko-Tekhnicheskij Inst.). 1980. 66p. (In Russian). NTIS (US Sales Only), PC A04/MF A01. Order Number DE82780211.

Individual items from the report were prepared separately for the data base. (GHT)

32709 **(LBL—13593) Review of meson spectroscopy: quark states and glueballs.** Chanowitz, M.S. (Lawrence Berkeley Lab., CA (USA)). Nov 1981. Contract W-7405-ENG-48. 92p. NTIS, PC A05/MF A01. Order Number DE82005651.

A group of three lectures on hadron spectroscopy are presented. Topics covered include: light L = 0 mesons, light L = 1 mesons, antiquark antiquark quark quark exotics, a catalogue of higher quark antiquark excitations, heavy quarkonium, and glueballs. (GHT)

32710 **(PLF—31) Time-resolved uv spectroscopy on ammonia excited by a pulsed CO_2 laser.** Holbach, H. (Max-Planck-Gesellschaft zur Foerderung der Wissenschaften e.V., Garching (Germany, F.R.). Projektgruppe fuer Laserforschung). Jul 1980. 117p. (In German). NTIS (US Sales Only), PC A06/MF A01. Order Number DE82780105.

This work investigates the excitation of ammonia by a pulsed CO_2 laser, in particular the processes associated with collisions with argon. It was prompted by two previous observations: the previously reported infrared multiphoton dissociation of NH_3 under nearly collisionless conditions, and the ill understood excitation mechanism of apparently nonresonant low vibrational levels in the presence of Ar. Based on recent spectroscopic data, all vibrational-rotational levels were determined which are simultaneously excited by different CO_2 laser lines. Transitions between the 1^+ and 2^- vibrational levels were also taken into account. The linewidth in these calculations was dominated by power broadening, which generates a half width at half maximum of 0.36 cm^{-1} at the typical power density of 10 MW/cm^2. In order to reproduce published experimental absorption data, it proved necessary to take account all transitions within a distance of 20 cm^{-1} from the laser line. This fact implies in most cases the simultaneous population of a large number of vibrational-rotational levels. The population of levels by absorption or by subsequent collisional processes was probed by time-resolved absorption measurement of vibrational bands and their rotational envelope in the near UV. Time resolution (5...10) was sufficient to observe rotational relaxation within individual vibrational levels. Characteristic differences were found for the various excitation lines.

32711 **(RI—120) Target sputtering by multicharged heavy ion beams.** Baranov, I.A.; Obnorskii, V.V. (Radievyj Inst., Leningrad (USSR)). 1980. 19p. (In Russian). (CONF-7904182—1). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700356.

From International conference on the experimental investigation at the U-400 accelerator; Dubna, USSR (18 Apr 1979).

Sputtering of targets made from U, UO_2, Pu, Am, Au, Nb, Cm, Cf under the action of heavy multicharged ion beams is considered. The sputtering coefficients estimations are made on the basis of previously performed experiments with fission fragments (FF) as well as on the basis of numerical calculations of sputtering coefficients K for some heavy ions in a wide energy range carried out within the framework of the Sigmund theory. It has been found out that K for fine-grained layers films and independently on the mtt may reach quite important values -10^3-10^4 at./fragm. and depend probably on grains distribution by dimensions in surface layers and energy spectrum. For massive metallic samples contradictory data are obtained: there are K values equal approximately 10^3 at./fragm., but at the same time - values approximately 50 at./fragm. and less. About the possible ways of matter leakage decreasing from the target so far one can definitely say that the target must operate under such conditions which prevent fine grain appearance on its surface.

32712 **Cross sections for electron impact ionisation of metastable rare-gas excimers ($He_2sup(*)$, $Kr_2sup(*)$, $Xe_2sup(*)$).** Flannery, M.R.; McCann, K.J. (Georgia Inst. of Tech., Atlanta (USA). School of Physics); Winter, N.W. (California Univ., Livermore (USA). Lawrence Livermore Lab.). *Journal of Physics B: Atomic and Molecular Physics;* **14**: No. 19, 3789-3796(14 Oct 1981).

Cross sections for electron impact ionisation of metastable rare-gas excimers ($He_2sup(*)$, $Kr_2sup(*)$ and $Xe_2sup(*)$) are evaluated using a binary encounter method with orbital speed distributions determined by the appropriate molecular orbital. Gaussian basis sets are calculated for $He_2sup(*)$ and $Kr_2sup(*)$ and potential energy curves are provided for $Kr_2sup(*)$. The resulting ionisation cross sections are of order 1 x 10^{-16} cm^2 and are about a factor of two higher for $Kr_2sup(*)$ and $Xe_2sup(*)$ than for $He_2sup(*)$. The cross sections for $Kr_2sup(*)$ and $Xe_2sup(*)$ are between 50% and 40% higher than the corresponding metastable atom cross sections.

32713 **Photoelectron spectroscopy of methyl, ethyl and isopropyl alcohol adsorbed on the (110) surface of Cu.** Carlson, T.A.; Agron, P.A. (Oak Ridge National Lab., TN (USA)); Thomas, T.M.; Grimm, F.A. (Tennessee Univ., Knoxville (USA)). *Journal of Electron Spectroscopy and Related Phenomena;* **23**: No. 1, 13-24(May 1981).

Methyl, ethyl and isoprobyl alcohol were allowed to adsorb on a clean (110) face of a copper crystal at room temperature, and photelectron spectra were obtained using He(I) (21.2 eV) radiation. The spectra of the adsorbed species differed sufficiently from those of the free molecules to indicate a chemical change on adsorption. In accordance with studies in the literature using flash-desorption and energy-loss spectroscopy, it is suggested that the observed spectra are those of the corresponding alkoxy radicals formed as a result of dehydrogenation. In the case of the methoxy radical, calculations were carried out for a cluster of nine copper atoms and the results shown to be consistent with the experimental data. Results were also obtained on the rates of adsorption and desorption and on the dependence of the spectra on the polar angle between the normal to the surface and the photoelectron direction. Finally, results were obtained on the extent of adsorption by means of X-ray photoelectron spectroscopy.

32714 **Energy and angular distribution of low energy H^+ and D^+ backscattered from polycrystalline carbon.** Overbury, S.H.; Dittner, P.F.; Datz, S. (Oak Ridge National Lab., TN (USA)); Thoe, R.S. (Oak Ridge National Lab., TN (USA); Tennessee Univ., Knoxville (USA)). *Journal of Nuclear Materials;* **93**: No. 94, 529-528(Oct 1980).

From 4. international conference on plasma surface interactions and controlled fusion devices; Garmisch-Partenkirchen, Germany, F.R. (21 - 25 Apr 1980).

The energy distributions of H^+ and D^+ backscattered from a polycrystalline graphite sample were recorded as a function of total scattering angle, angle of incidence, and for incident beam energies $200 < Esub(i) < 3000$ eV. The general shapes of the distributions are discussed qualitatively, and their variation with incident energy and total scattering angle are explained and compared with theoretical and other experimental results. The average energies anti E^+ of the distributions are found to increase relative to the single scattering energy, Esub(k), with decreasing incident energy. anti E^+/ Esub(k) also increases with decreasing exit angle from the solid in a way which is slightly dependent upon the angle of incidence. The integrated intensities of the distributions are found to depend strongly upon the angle of incidence, with a normally incident beam producing a nearly cosine distribution of backscattered ions and grazing angles of incidence producing an intensity which peaks at an angle forward of the specular direction. Using charge fractions obtained previously for surface scattering from graphite and transmission through thin carbon foil, values of the particle reflection coefficient Rsub(N) are obtained as a function of energy.

32715 **Surface composition and erosion yields for CVD TiB_2 films subjected to low energy deuterium ion bombardment.** Nelson, G.C.; Borders, J.A. (Sandia National Labs., Albuquerque, NM (USA)). *Journal of Nuclear Materials;* **93**: No. 94, 640-644(Oct 1980).

From 4. international conference on plasma surface interactions and controlled fusion devices; Garmisch-Partenkirchen, Germany, F.R. (21 - 25 Apr 1980).

The surface composition and low energy sputter yield of deuterium bombardment CVD TiB_2 films have been measured. The sputter yield increases with energy up to 1 keV where it reaches a maximum of 0.024 atoms/ion. Above 1 keV the yield decreases due to ion penetration effects. Surface composition measurements using Auger, X-ray photoelectrons and secondary ion mass spectroscopies show that a surface layer about 200 Angstroem thick is depleted in B during 2 keV deuterium bombardment. This effect is attributed to preferential sputtering. Oxides and deuterides of titanium are also observed on the deuterium bombarded TiB_2 surface.

32716 **Monte Carlo calculations of light-ion sputtering as a function of the incident angle.** Haggmark, L.G. (Sandia National Labs., Livermore, CA (USA)); Biersack, J.P. (Hahn-Meitner-Institut fuer Kernforschung Berlin G.m.b.H. (Germany, F.R.)). *Journal of Nuclear Materials;* **93**: No. 94, 664-669(Oct 1980).

From 4. international conference on plasma surface interactions and controlled fusion devices; Garmisch-Partenkirchen, Germany, F.R. (21 - 25 Apr 1980).

The sputtering of metal surfaces by light ions has been studied as a function of the incident angle using an extension of the TRIM Monte Carlo computer program. Sputtering yields were calculated at both normal and oblique angles of incidence for H, D, T, and ^4He impinging on Ni, Mo, and Au targets with energies $<=$ 10 keV. Direct comparisons are made with the most recent experimental and theoretical results. There is generally good agreement with the experimental data although our calculated maximum in the yield usually occurs at a smaller incident angle, measured from the surface normal. The enhancement of the yield at large incident angles over that at normal incidence is observed to be a complex function of the incident ion's energy and mass and the target's atomic weight and surface binding energy.

32717 **Observation of surface dissociation of HgTe crystal by means of 42MeV-O^{5+} backscattering.** Takita, K.; Masuda, K. (Tsukuba Univ., Sakura, Ibaraki (Japan)); Kudo, H.; Seki, S. pp 289-292 of Proceedings of the fourth symposium on ion sources and ion application technology. Takagi, T.; Akimune, H.; Fukumoto, S. Tokyo, Japan; Inst. of Electr. Eng. of Japan (1980).

From 4. symposium on ion sources and ion application technology; Tokyo, Japan (24 Jun 1980).

32718 **Characterization of ion beam processed Si surface layer.** Ohira, F.; Itakura, M. (Musashino Electrical Communication Lab., Tokyo (Japan)). pp 299-302 of Proceedings of the fourth symposium on ion sources and ion application technology. Takagi, T.; Akimune, H.; Fukumoto, S. Tokyo, Japan; Inst. of Electr. Eng. of Japan (1980).

From 4. symposium on ion sources and ion application technology; Tokyo, Japan (24 Jun 1980).

6404 Fluid Physics

REFER ALSO TO CITATION(S) 32262, 32263, 32264

32719 **(JINR—8-80-536) Experimantal study on heat transfer in He-I and He-II for stationary thermal load.** Arkharov, A.M.; Ageev, A.I.; Pryanichnikov, V.I.; Rubin, N.B. (Joint Inst. for Nuclear Research, Dubna (USSR). Dept. of New Acceleration Methods). 1980. 4p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700141.

The results of experimental study on heat transfer from copper sample in He-1 and He-2 are presented. The values $q=f(\Delta T)$, qsub(cr) and ΔTsub(cr) for He-1 and He-2 have been obtained. The comparison with other experimental data for relevant field shows a satisfactory divergence.

32720 **(KFK—3170) Variants of ICE-technique with reduction of numerical damping.** Benner, J. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Inst. fuer Reaktorentwicklung; Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Projekt Nukleare Sicherheit). Jun 1981. 78p. (In German). NTIS (US Sales Only), PC A05/MF A01. Order Number DE82780299.

The ICE-(Implicit-Continuous-Eulerian) technique is a widespread numerical method for solving flow-problems. This method has many advantages but suffers on strong numerical damping. Here some variants of this technique are investigated in order to find a stable variant with as least damping as possible. For testing we used a one-dimensional (1D) problem (shock tube) and two two-dimendional (2D) problems (shallow water flow, backward facing step). The calculations show that in may cases the numerical results of ICE are improved by a lower degree of implicitness of the finite difference equations. The use of central differences instead of onesided upwind differences is generally not advisable because then the scheme is less stable.

32721 **Dielectric breakdown in liquid helium.** Yoshino, K.; Fujii, H.; Kaizaki, I.; Inuishi, Y. (Osaka Univ., Suita (Japan). Faculty of Engineering). pp 172-176 of Superconductive energy storage. Proceedings of the international symposium. Nishimura, M. (ed.). Osaka, Japan; Kuroki Publishing Company (1980).

From International symposium on superconductive energy storage; Osaka, Japan (8 Oct 1979).

Breakdown characteristics in liquid He are studied and compared with those of other cryogenic liquids such as liquid Ar, N_2. Breakdown strength of liquid He is much higher than that of liquid Ar but lower than that of liquid N_2. The formative time lag of breakdown in liquid He is much shorter compared with the electron transit time between electrodes expected from low field electron mobility. Under non-uniform field condition, the breakdown strength of negative needle is always lower than that of positive needle and also even than that of parallel electrode system with uniform field. Breakdown strength is strongly dependent on the

work function of cathode metal. Pure liquid He shows higher breakdown strength than impure liquid He. These facts indicate that electron injection from cathode plays most important role in the breakdown process in liquid He.

6451 Particle Interactions And Properties - Experimental

REFER ALSO TO CITATION(S) 32365, 32436, 32438, 32439

32722 (DOE/ER/03285—40) Search for excited leptons in the next generation of experiments. Domokos, G.; Koevesi-Domokos, S. (Johns Hopkins Univ., Baltimore, MD (USA). Dept. of Physics). Sep 1981. Contract AS02-76ER03285. 7p. (JHU-HET—8108). NTIS, PC A02/MF A01. Order Number DE82006959.

Production cross sections of excited leptons in e^+e^- annihilation experiments are estimated. Light excited states can be produced below the characteristic energy scale at which hypothetical constituents of leptons become bound: therefore the estimates are expected to be valid for E/sub cm/ $\leqq$ 100 GeV, and to a large degree, model independent. The results are expressed in terms of measurable low energy parameters. It is concluded that high precision experiments are needed for an effective search for excited leptons.

32723 (DOE/ER/10516—10) Nucleon-nucleon theory and phenomenology. Progress report and renewal proposal. Signell, P. (Michigan State Univ., East Lansing (USA). Dept. of Physics). 1981. Contract AC02-79ER10516. 12p. NTIS, PC A02/MF A01. Order Number DE82006903.

Progress is outlined on five inter-related subprojects: (1) derivation of the intermediate range nucleon-nucleon interaction with the new dramatically altered $\pi\pi$ s-wave interaction and using a new method that utilizes much shorter and simpler analytic continuation through the unphysical region that lies between the πN and $\pi\pi$ physical regions of the N anti N $\rightarrow \pi\pi$ amplitude (with significantly improved accuracy for the nucleon-nucleon interaction); (2) construction of a short range phenomenological potential that, with the theoretical part mentioned above, gives a precise fit to the nucleon-nucleon data and is parameterized for easy use in nucleon calculations; (3) phase shift analyses of the world data below 400 MeV, especially the large amount of very precise data below 20 MeV and the new data near 55 MeV that have never been analyzed properly, and determining which phases are given by theory at which energies; (4) the introduction of our K-matrix formulation of the Optimal Polynomial Expansion in order to accelerate convergence of the partial wave series at LAMPF energies; and (5) setting up of a cooperatively evaluated and verified permanent nucleon-nucleon data bank in the 0 to 1200 MeV range that can be used by all nucleon-nucleon researchers (or anyone else) via Telenet dial-in and by means of a published compendium. (WHK)

32724 (FERMILAB-Conf—81/80-Exp.) Recent results on total neutrino and antineutrino cross sections by the CFRR collaboration. Rapidis, P.A.; Barish, B.C.; Blair, R.E. (Fermi National Accelerator Lab., Batavia, IL (USA); California Inst. of Tech., Pasadena (USA)). Dec 1981. Contract AC02-76CH03000. 22p. (CONF-810770—2). NTIS, PC A02/MF A01. Order Number DE82004401.

From Summer institute on particle physics; Stanford, CA, USA (27 Jul 1981).

Normalized cross sections for charged current neutrino and antineutrino-nucleon scattering are presented. The cross sections can be parametrized as a linear rising function of the incident neutrino energy, with σ/sub ν//E = 0.720 +- 0.030 x 10^{-38} and σ/sub anti ν//E = 0.360 +- 0.023 x 10^{-38} cm^2/GeV. These results are $\sim$ 15% higher than previous measurements. Preliminary structure functions at low Q^2 are also presented.

32725 (JINR—1-81-82) Elastic d-d small angle scattering at 4.6 GeV/c. Deenski, P.A.; Zayachki, V.J.; Trajkova, M.D.; Kanazirski, Kh.M.; Shablovski, M.; Nikitin, V.A.; Zhidkov, N.K. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of High Energy). 1981. 5p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700222.

The experimental results on the differential cross sections of the elastic d-d scattering at deutron momentum of 4.6 GeV/c in the range of 4=momentum transferred squared $0.0275 <= 't' <= 0.146$ (GeV/c)^2 are presented. The data are analysed using the Bethe differential formula and are compared with the calculations by Glauber's model. A good accord is stated.

32726 (KEK—79-33, pp 211-241) Present experiments at KEK 12 GeV PS. Watase, Y. (National Lab. for High Energy Physics, Oho, Ibaraki (Japan)). Mar 1980. NTIS (US Sales Only), PC A14/MF A01.

From KEK summer school; Oho, Japan (10 Aug 1979).

The experiments on weak interaction and the hadronic production of leptons performed at the KEK 12 GeV PS facility are described. Two weak interaction experiments and two direct electron production experiments in collisions of hadrons are introduced. One of the experiments aimed at checking the Cabibbo theory. Polarized Λ beam was produced in proton-proton collision, and the decay of Λ to $pe^-\nu$ and to $p\mu^-\nu$ were measured. The asymmetry parameters on Λ to $pe\nu$ and Λ to $p\mu\nu$ are expected to have the statistical error less than 0.01 and 0.02, respectively. Another experiment aimed at studying the existence of non-zero-Δ S neutral current and to check the gauge model of weak interaction. Low momentum kaon beam was used. The measurements of direct lepton production were carried out to study the excess yields of leptons directly produced in the proton-induced reactions. Counter experiment and bubble chamber experiment were designed.

32727 (KEK—79-33, pp 242-285) Measurement of total cross-section of antiproton-proton reaction in the momentum range between 400 and 700 MeV/c. Nakamura, K. (Tokyo Univ. (Japan). Dept. of Physics). Mar 1980. NTIS (US Sales Only), PC A14/MF A01.

From KEK summer school; Oho, Japan (10 Aug 1979).

Low momentum antiproton-proton experiment was performed at the K^3 beam channel of KEK. The primary purpose of this experiment is to investigate the famous S (1936) resonance, which is a candidate of a baryonium, an exotic meson composed of two quarks and two antiquarks. A stable hadron is called exotic if its quark configuration is other than quark-antiquark or quark-quark-quark. The existence of the baryoniums was first predicted by duality argument. A good deal of experimental effort has been made in search of baryoniums. Experiments are classified into two categories. The one is resonance search in antiproton-proton interaction and the other is bump hunting in production experiments. Once the S resonance seemed to be established, but at present, the very existence of the S resonance has become a burning question. The present experimental method is the total cross section measurement known as the transmission method, where the particles transmitted to a target without interacting in it are counted. The possible narrow structure (in particular, the S resonance) in the antiproton-proton total cross section in the momentum range between 400 and 700 MeV/c was investigated. Multiwire proportional chambers and a magnetic spectrometer were used. The preliminary result is consistent with the nonexistence of the S resonance.

32728 (SLAC—245, pp 477-494) Charm particle production in hadronic interactions: recent results from CERN at SPS energies. Dionisi, C. (Univ. of Roma, IT). Jan 1982. NTIS, PC A99/MF A01.

From Summer institute on particle physics; Stanford, CA, USA (27 Jul 1981).

So far there has been only scanty direct evidence for charmed meson and baryon production in hadronic interactions at SPS energies (100- to 400 GeV). One well-known reason for this is the rather unfavourable signal to noise ratio and the very large combinatorial background that characterize the hadron production of charmed particles. One way out is to take advantage of the fact that in hadron interactions charmed particles are produced in pairs

and then require a positive signature from EACH of the charm particles. For instance, search of narrow mass peaks in Cabibbo favored ($\Delta C = \Delta S$) hadronic final states with associated leptons of the right charge as the second signature. Another way is to observe directly, with very high resolution vertex detectors, the production and subsequent decay of short-lived particles. This is, in principle, the only clean method of resolving these events from the background. Here are presented recent results from two experiments carried out at the CERN SPS where the above two methods have been used.

32729 (SLAC—245, pp 495-512) **Investigation of deep inelastic hadron hadron collisions using a transverse energy trigger with large acceptance.** Pretzl, K.P. (Max Planck Institut fuer Physik und Astrophysick, Munich, Germany). Jan 1982. NTIS, PC A99/MF A01.

From Summer institute on particle physics; Stanford, CA, USA (27 Jul 1981).

Hadron hadron collisions were studied with a large acceptance transverse energy trigger at SPS and ISR energies. Preliminary results from the NA-5, R(416) and R(807) experiments at CERN are presented. The selected events show large multiplicities and no predominant jet structure. Processes other than the scattering of two constituents appear to dominate these inelastic collisions.

32730 (SLAC—245, pp 641-661) **Recent results on total neutrino and antineutrino cross sections by the CFRR collaboration.** Barish, B.C. (California Inst. of Technology, Pasadena); Blair, R.E.; Chu, Y.K. Jan 1982. NTIS, PC A99/MF A01.

From Summer institute on particle physics; Stanford, CA, USA (27 Jul 1981).

Results are presented on normalized cross sections for charged current neutrino and antineutrino-nucleon scattering. The cross sections can be parametrized as a linearly rising function of the incident neutrino energy, with sigma/sub nu//E = 0.720 +- 0.030 x 10^{-38} and sigma/sub anti nu//E = 0.360 +- 0.23 x 10^{-38} cm^2/GeV. These results are ~ 15% higher than previous measurements. Preliminary structure functions at low Q^2 are also presented.

32731 (SLAC—245, pp 663-683) **Structure functions in deep inelastic lepton nucleon scattering.** Wahlen, H. (Gesamthochschule Wuppertal, Germany, F.R.). Jan 1982. NTIS, PC A99/MF A01.

From Summer institute on particle physics; Stanford, CA, USA (27 Jul 1981).

Measurements of structure functions F_2, xF_3 and R = sigma/sub L//sigma/sub T/ in muon and neutrino scattering at CERN are reviewed. The analysis of these data in terms of perturbative QCD and higher twist contributions is discussed.

32732 **Pion pair production in photon-photon collisions at spear.** Roussarie, A.; Burke, D.L.; Abrams, G.S.; Alam, M.S.; Blocker, C.A.; Blondel, A.; Boyarski, A.M.; Breidenbach, M.; Carithers, W.C.; Chinowsky, W. (Stanford Linear Accelerator Center, CA (USA). *Physics Letters, [Section] B;* **105**: No. 4, 304-308(8 Oct 1981).

We report a measurement of the cross section for the process $\gamma\gamma \to \pi^+\pi^-$ at invariant masses 500 MeV/c^2 < msub(π)sub(π) < 2000 MeV/c^2. A value for the radiative width of the f(1270) tensor meson GAMMAsub(f)sub(->)sub(γ)sub(γ) = 3.6 +- 0.3 +- 0.5 keV (helicity lambda = 2) has been obtained from a fit to the observed $\pi\pi$ mass spectrum.

32733 **Effects of oscillations on neutrinos generated by cosmic rays in the earth's atmosphere.** Silberberg, R.; Shapiro, M.M. (Naval Research Lab., Washington, DC (USA)). pp 180-183 of Conference papers. 17. International cosmic ray conference, Paris, 13-25 July 1981. Vol. 7, MN Session. Paris, France; Commissariat a l'Energie Atomique (1981).

From 17. international cosmic ray conference; Paris, France (13 Jul 1981).

Recent indications of neutrino oscillations (Reines, et al., 1980) would have certain consequences for the neutrinos generated by cosmic rays in the earth's atmosphere. The intensity of ν/sub e/ produced by cosmic-ray interactions in the atmosphere would be enhanced. Above 100 GeV, the ratio of ν/sub e/ + anti ν/sub e/ to ν/sub μ/ + anti ν/sub μ/ would be increased by an order of magnitude. This enhancement is pronounced only for neutrinos that traverse the earth upward, up to energies near 10^4 GeV. It is suppressed at higher energies owing, in part, to the relativistic dilation of the oscillation length.

32734 **KEK: $(UT)^2$ experiment on proton decay.** Ikeda, H.; Sugawara, H.; Suzuki, A. (Tsukuba Univ., Sakura, Ibaraki (Japan)). pp 185 of Conference papers. 17. International cosmic ray conference, Paris 13-25 July 1981. Vol. 7, MN Session. Paris, France; Commissariat a l'Energie Atomique (1981).

From 17. international cosmic ray conference; Paris, France (13 Jul 1981).

32735 **Bimodality of angular distribution in hadron-nucleon interactions at 200 to 400 GeV.** Maslennikova, N.U.; Orlova, G.I.; Orlov, A.M.; Salmanova, N.A.; Tretyakova, M.I.; Chernyavski, M.M. (AN SSSR, Moscow. Fizicheskij Inst.). pp 10-13 of Conference papers. 17. International cosmic ray conference, Paris, 13-25 July 1981. Vol. 5, HE Session. Paris, France; Commissariat a l'Energie Atomique (1981).

From 17. international cosmic ray conference; Paris, France (13 Jul 1981).

An analysis of angular distributions in hadron-nucleon interactions at 200 to 400 GeV shows that considerable part of events (approximately 20%) have two maximum structure. Comparison such events with multicluster model reveals that this effect is due to production and decay of two or more clusters.

32736 **Is the proton stable.** Goldhaber, M.; Langacker, P.; Slansky, R. *Science (Washington, D.C.);* **210**: No. 4472, 851-860(21 Nov 1980).

For nearly 50 years there has been a strong belief that the proton is absolutely stable. The current experimental upper bound on its decay rate is less than one proton decay per 3 tons of matter per year, which corresponds to a mean lifetime of more than 10^{30} years. Even more sensitive searches for proton decay are now in progress. These are partially motivated by the development of a class of models that combine the presently accepted theories of electromagnetic, weak, and strong interactions into an elegant unified form. Some of these theories predict a proton lifetime short enough for the decays to be detectable by the proposed experiments. If the porton is unstable, a plausible explanation can be given for the apparent excess of matter over antimatter in the universe.

32737 **Interpretation of the N(1360) Gamma < 67 resonance.** Mac Gregor, M.H. (Univ. of California, Livermore). *Lettere al Nuovo Cimento;* **28**: No. 3, 85-88(17 May 1980). Contract W-7405-ENG-48.

The single-baryon Nu(1360) Gamma < 67 peak is shown to be related to a type of systematics discovered in dibaryon pp resonances. The analysis is carried out using published π N data. N(1521)D and N(1687)F resnances are identified as the l = 2 and l = 3 rotational levels in a nonadiabatic baryon rotational band. The N(1360) resonance is shown to match the position of the S-state rotational bandhead and N(1413)P matches the l = 1 level.

6452 Particle Interactions And Properties - Theoretical

REFER ALSO TO CITATION(S) 32422, 32436, 32722, 32736, 32752, 32755, 32756, 32760

32738 **(DOE/ER/03285—41) Research in theoretical physics. Annual progress report, April 1, 1981-March 31, 1982.** Domokos, G.; Koevesi-Domokos, S. (Johns Hopkins Univ., Baltimore, MD (USA). Dept. of Physics). Nov 1981. Contract AS02-76ER03285. 21p. (JHU-HET—8109). NTIS, PC A02/MF A01. Order Number DE82006825.

The following results are reported: (1) phenomenological investigation of preon models. A renormalization group analysis suggests the existence of excited quarks and leptons within the range of the next generation of experiments. The feasibility of such experiments is analyzed; a search for excited leptons in e^+e^- annihilation at CMS energies around the mass of the Z^0 is suggested; (2) the geometrical structure of unified schemes in spaces of $d > 4$ suggests a possible interpretation of color and flavor quantum numbers in terms of internal geometry; (3) critical fluctuations preceding a deconfining phase transition in hadron matter should be observable by measuring the high energy tail of the spectrum of direct photons in heavy ion collisions; and (4) genetic damage caused by diagnostic ultrasound was investigated. We suggest that the damage to DNA results as a consequence of its breakup due to the excitation of collective modes.

32739 (INS—393) **Sigma model in many body problem.** Tezuka, H. (Tokyo Univ., Tanashi (Japan). Inst. for Nuclear Study). Nov 1980. 16p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700202.

The linear σ model is applied to the many body problem. Masses of nucleon, sigma meson and pion depend on the nucleon density. It is shown that the effective pion mass becomes naught at much lower density than the normal density. This suggests that pions condense at the normal density. Thus we must take pion condensation into consideration when we apply this model to many body problem.

32740 (KEK—79-33, pp 141-210) **Multihadron production in hadronic, leptonic and nuclear reactions at high energies.** Kinoshita, K. (Kagoshima Univ. (Japan). Faculty of Education). Mar 1980. NTIS (US Sales Only), PC A14/MF A01.

From KEK summer school; Oho, Japan (10 Aug 1979).

The jets of hadrons are discussed theoretically. The mechanism of hadronization of hardly deflected constituent, and the dynamics of the fragmentation of an incident hadron into multihadron states owing to collision interaction are described. Survey of models is presented. The uncorrelated jet model is considered as a model of multiparticle final state. A fast moving hadron toward the longitudinal direction is regarded as non-monochromatic beam of partons collimated to the same direction. The characteristics of the Kuti-Weisskopf model is presented. The memory of initial quarks is preserved in a fast hadron containing it, seen from the flavor structure of hadron distribution. The perturbative quantum chromo-dynamics (QCD) approach provides the jet shower of partons up to pre-confinement stage, which is expected to continue smoothly to the non-perturbative, confinement stage of hadronization. The quark-chain structure incorporating the cascade relation seems to embody the essential features of hadronic final states, Incorporation of baryons into the quark chain is easily done by treating the di-quark as the additional link element of the chain. Problems of the space-time evolution of hadronization process and comparison with nucleus target data are discussed.

32741 (KEK—79-33, pp 1-41) **Experimental meson spectroscopy.** Ozaki, S. (Brookhaven National Lab., Upton, NY (USA)). Mar 1980. NTIS (US Sales Only), PC A14/MF A01.

From KEK summer school; Oho, Japan (10 Aug 1979).

This paper is described on the review of meson spectroscopy. First, history of the models of hadrons. Mesons are now considered to be the bound state of quark-antiquark pairs. Existence of five flavors of quarks is known, and quarks are thought to carry strong interaction charge called color. Quark configuration in mesons is discussed. Currently, mesons are arranged according to their principle quantum number $N = (2n + L)$ where n is radial excitation, and L is orbital angular momentum of quark-antiquark system. In this representation, the energy of the level (or mass) should show increase as N and L increase. A resultant large box is divided into 4 by 4 matrix of the nonet and isospin of the multiplet. The current status of baryonium is discussed. A series of narrow peaks in the missing mass spectra were observed with a CERN missing mass spectrometer. An experiment at CERN Omega spectrometer observed two narrow resonances. The speculation that these baryonium states are exotic four quark or six quark states is presented. Lower mass mesons are in good shape in terms of a picture based on mesons being the bound states of a quark and an antiquark. For high mass levels, situation is far from ideal. The MPS (multiparticle spectrometer) is explained. Large numbers of interaction can be handled in a short time. The phenomena with cross-section of 10 nb can be studied. The unusual situation that the forbidden reaction produces higher phi enhancement over K^+K^- background than the allowed reaction was observed. The MPS has been active in the searches of exotic states and charmed particles.

32742 (KEK—79-33, pp 74-140) **High energy hadron physics with the FNAL Hybrid bubble chamber system.** Yamamoto, R.K. (Massachusetts Inst. of Tech., Cambridge (USA)). Mar 1980. NTIS (US Sales Only), PC A14/MF A01.

From KEK summer school; Oho, Japan (10 Aug 1979).

Hadron physics at high energy is described. The kinematic variables and some of the language used in this field, the Fermilab Hybrid Spectrometer, and some results obtained from the Hybrid Spectrometer at about 150 GeV are discussed. Two basic facts underlie hadronic interactions. The transverse momentum of particles produced in one interaction is limited. The number of particles produced in one interaction is far less than that possible from the available energy. Due to these two facts of hadronic nature, the longitudinal momentum of particles produced in one interaction plays a key role in describing an event. Because of this role of the longitudinal momentum, the rapidity variable y and the Feynman scaling variable x will be used for the discussion. Limiting fragmentation and scaling, the finite correlation length hypothesis, and the Mueller-Regge analysis are discussed. The Fermilab Hybrid Spectrometer consists of electronic detectors and a hydrogen bubble chamber to improve the measuring capability of fast particles and the precision of measurement of slower particles. Good test of the target fragmentation hypothesis is performed. The indication of the validity of the hypothesis is obtained. Average multiplicity in the reactions (a + b to X) and (a + b to C + X) is discussed. The charge transferred across a rapidity gap is examined as a function of the gap length. Self-consistent checks are made on the data, based on the Random Charge Model, the Extreme Charge Model, and the Leading Charge Model.

32743 (SLAC—245, pp 41-86) **Meson spectroscopy: quark states and glueballs.** Chanowitz, M.S. (Lawrence Berkeley Lab., CA). Jan 1982. NTIS, PC A99/MF A01.

From Summer institute on particle physics; Stanford, CA, USA (27 Jul 1981).

Topics covered in this review include: light L = 0 mesons; light L = 1 mesons; antiquark-antiquark-quark-quark exotics; a catalogue of higher quark-antiquark excitations; heavy quarkonium; and glueballs. 123 references. (GHT)

32744 (SLAC—245, pp 141-193) **Untangling jets from hadronic final states.** Fox, G. (California Inst. of Technology, Pasadena). Jan 1982. NTIS, PC A99/MF A01.

From Summer institute on particle physics; Stanford, CA, USA (27 Jul 1981).

We describe how to blend perturbative QCD and phenomenological fragmentation to model hadron formation in e^+e^- annihilation and high Q^2 hadron hadron collisions. We concentrate on the validity of this blending and the generation of the multi-parton final states expected in the new very high energy colliding beam accelerators.

32745 (SLAC—245, pp 195-259) **Heavy flavor production from photons and hadrons.** Heusch, C.A. (Santa Cruz Inst. for Particle Physics, CA). Jan 1982. NTIS, PC A99/MF A01.

From Summer institute on particle physics; Stanford, CA, USA (27 Jul 1981).

The present state of the production and observation of hadrons containing heavy quarks or antiquarks as valence constituents, in reactions initiated by real and (space-like) virtual photon or by hadron beams is covered. Topics covered include: heavy flavors from spacelike photons; heavy flavors from real photons; and heavy flavors from hadron-hadron collisions. (GHT)

32746 (SLAC—245, pp 427-439) **Pion production of chi mesons.** Kirk, T.B. (Fermilab, Batavia, IL). Jan 1982. NTIS, PC A99/MF A01.

From Summer institute on particle physics; Stanford, CA, USA (27 Jul 1981).

Preliminary results are reported from an experiment carried out in Spring 1979 at Fermilab by the Fermilab, Illinois, Pennsylvania, Purdue, Tufts Group. The purpose of the experiment was to examine hadrons and photons accompanying hadronic production of psi/J mesons in order to explore the production mechanisms. The results reported here involve only the study of photons produced in association with psi/J by 219 GeV π^- mesons incident on a beryllium target.

32747 (SLAC—245, pp 441-458) **Photoproduction of charmed particles at 19.5 GeV.** Brau, J.E. (Stanford Linear Accelerator Center, CA). Jan 1982. NTIS, PC A99/MF A01.

From Summer institute on particle physics; Stanford, CA, USA (27 Jul 1981).

A photoproduction experiment is in progress at the SLAC Hybrid Facility. This talk describes the experiment and presents its first results. The charm photoproduction cross section at 19.5 GeV has been measured and the charged and neutral D meson lifetimes have been determined. Each of these experimental results will be discussed in the context of theoretical expectations.

32748 (SLAC—245, pp 459-476) **QCD and heavy quark atoms.** Lepage, G.P. (Cornell Univ., Ithaca, NY). Jan 1982. NTIS, PC A99/MF A01.

From Summer institute on particle physics; Stanford, CA, USA (27 Jul 1981).

There is abundant evidence suggesting that the psi and Y systems are predominantly Q anti Q bound states with little admixtures of higher Fock states. The quantum numbers, the success of the nonrelativistic potential models, and the successes of the multipole expansion for hadronic transitions all argue in favor of this picture. Given this, we can use Q anti Q states as a laboratory for studying and testing QCD. The spectrum of states in effect measures the Q anti Q potential as a function of r. The s-state decays determine the QCD coupling constant and provide information about the gluon and gluon jets. In some ways these systems are the best for testing QCD because we know so much about their internal structure. The uncertainties due to bound state effects in Y decay are probably much better under control than those due to higher twist corrections in deep inelastic scattering. Finally, these systems may provide useful sources for exotic physics - e.g., t anti t $\rightarrow$ Higgs + γ.

32749 (SLAC—245, pp 603-619) **Free quark search at PEP.** Karliner, I. (Univ. of Hawaii, Honolulu). Jan 1982. NTIS, PC A99/MF A01.

From Summer institute on particle physics; Stanford, CA, USA (27 Jul 1981).

Since 1964, when quarks were first introduced as basic building blocks of the SU(3) symmetry and components of hadrons, there have been many attempts to discover a real particle with fractional charge. Techniques have included studies of stable matter, cosmic ray searches, and production experiments using accelerators. The history of the quark searches are reviewed and results obtained by different groups are compared.

32750 **Calculation of electron-photon cascades in the energy range of 10^{15}-10^{19} eV taking into account the LPM effect.** Dedenko, L.G. (Moskovskij Gosudarstvennyj Univ. (USSR). Nauchno-Issledovatel'skij Inst. Yadernoj Fiziki); Matushko, V.L.; Stern, B.E.; Zheleznykh, I.M. (AN SSSR, Moscow. Inst. Yadernykh Issledovanij). pp 159-162 of Conference papers. 17. International cosmic ray conference, Paris, 13-25 July 1981. Vol. 7, MN Session. Paris, France; Commissariat a l'Energie Atomique (1981).

From 17. international cosmic ray conference; Paris, France (13 Jul 1981).

Mean characteristics of electron-photon cascades at high energies have been calculated by the method with statistical weights. The LPM (Landau Pomeranchuk and Migdal) effect is taken into account.

32751 **Critical evaluation of the single particle inclusive cross sections used for describing particle production in high energy cosmic ray interactions.** Ghoshdastidar, M.R.; Goswami, G.C.; Ghosh, B.; Basak, D.K.; Chaudhuri, N. (Univ. of North Bengal (India)). pp 1-4 of Conference papers. 17. International cosmic ray conference, Paris, 13-25 July 1981. Vol. 5, HE Session. Paris, France; Commissariat a l'Energie Atomique (1981).

From 17. international cosmic ray conference; Paris, France (13 Jul 1981).

Various single particle inclusive cross section formulae which have recently been used in the calculations of cosmic ray cascading have been critically examined. This evaluation reveals the degree to which the various forms of cross section representations show unity in their predictions and with currently available more accurate cross sections at higher energies.

6454 Field Theory

REFER ALSO TO CITATION(S) 32731, 32748

32752 **(BNL—30432) Phase transitions and elementary-particle physics.** Creutz, M. (Brookhaven National Lab., Upton, NY (USA)). 1981. Contract AC02-76CH00016. 12p. (CONF-811172—1). NTIS, PC A02/MF A01. Order Number DE82005502.

From 9. midwest solid state theory symposium on melting, localization and chaos; Argonne, IL, USA (2 Nov 1981).

The reason physicists have recently taken an intense interest in the statistical mechanics of certain lattice models is reviewed. Phase transitions in these systems are of direct relevance to whether the gauge theory of interacting quarks and gluons can prevent the quark as appearing as a free isolated object. Monte Carlo simulation techniques have given the strongest evidence for the confinement phenomenon and are beginning to make numerical predictions in strong interaction physics.

32753 (KEK—79-33, pp 42-73) **Flavor dynamics.** Kobayashi, M. (National Lab. for High Energy Physics, Oho, Ibaraki (Japan)). Mar 1980. NTIS (US Sales Only), PC A14/MF A01.

From KEK summer school; Oho, Japan (10 Aug 1979).

The problems on quark mass and mixing angle are discussed. All discussions are made in the tree approximation, and no renormalization problem is considered. The basic quantities of the Weinberg-Salam (W-S) model are introduced. The model is SU(2) x U(1) gauge theory. The way of constructing the quark parts of Lagrangian, especially their mass terms, is described. The four-quark case is illustrated at first, then the discussion is extended to the general case. As a result, the number of parameters of the Cabibbolike mixing is obtained. The possibility of CP-violation is discussed. Phenomenological analyses are made to determine the parameters. The nuclear beta-decay and semileptonic decay, neutral K-meson system, and the possibility of CP-violation in the six-quark scheme are investigated. In order to understand the close relation between quark mass and mixing angle, the origin of quark mass term is investigated. The original Higgs coupling determines both the quark mass and mixing angle. A remarkable relation is deduced by assuming discrete symmetry.

32754 **(LA-UR—81-3636) Polyacetylene: a real material linking condensed matter and field theory.** Campbell, D.K. (Los Alamos National Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 13p. (CONF-8108108—1). NTIS, PC A02/MF A01. Order Number DE82006154.

From Conference on structural elements and statistical mechanics on field theory; Freiburg, F.R. Germany (31 Aug 1981).

One of the most active subjects of recent research at the interface between field theory and statistical mechanics concerns a real material that seems more properly to belong to the arcana of organic chemistry than to either field theory or statistical methanics. The material is polyacetylene ((CH)/sub x/), a quasi-one dimensional organic polymer with some very interesting and potentially exotic properties. In this discussion, a pedagogical introduction is

given to some of the recent theoretical studies of polyacetylene to convey some of the reasons for the intense excitement in this area.

32755 (SLAC—245, pp 1-40) **Quark-antiquark bound state spectroscopy and QCD.** Bloom, E.D. (Stanford Linear Accelerator Center, CA). Jan 1982. NTIS, PC A99/MF A01.

In Proceedings of summer institute on particle physics, July 27-August 7, 1981: the strong interactions.

A review is presented of current knowledge of particle spectra, particularly the study of the spectroscopy of quark-antiquark bound systems as a way of gaining understanding of quark dynamics. (GHT)

32756 (SLAC—245, pp 87-140) **Quantum chromodynamics and hadronic interactions at short distances.** Brodsky, S.J. (Stanford Linear Accelerator Center, CA); Huang, T.; Lepage, G.P. Jan 1982. NTIS, PC A99/MF A01.

From Summer institute on particle physics; Stanford, CA, USA (27 Jul 1981).

The main purpose of this lecture is to begin to extend QCD phenomenology by taking into account the physics of hadronic wavefunctions. The eventual goal is to obtain a parametrization of the wavefunctions which will bridge the gap between the non-perturbative and perturbative aspects of QCD. The lack of knowledge of hadronic matrix elements is the main difficulty in computing and normalizing dynamical higher twist contributions for many processes.

32757 (SLAC—245, pp 513-533) **Recent results in lattice gauge theories.** Weinstein, M. (Stanford Linear Accelerator Center, CA). Jan 1982. NTIS, PC A99/MF A01.

From Summer institute on particle physics; Stanford, CA, USA (27 Jul 1981).

The present status of Lattice Quantum Chromodynamics and its usefulness as a theory of strong interactions are discussed. (GHT)

32758 (SLAC—245, pp 621-640) **Technicolour - oasis or mirage.** Ellis, J. (European Organization for Nuclear Research, Geneva, Switzerland). Jan 1982. NTIS, PC A99/MF A01.

From Summer institute on particle physics; Stanford, CA, USA (27 Jul 1981).

Most of this talk concerns composite Higgs fields, starting off with the elementary ideas of dynamical symmetry breaking and technicolor, and then discussing the need to extend the technicolor interactions in order to give masses to fermions. Some technical problems arising in determining the pattern of dynamical symmetry breaking and the criterion of the most attractive channel (MAC) are touched upon but not elaborated. Most of the talk emphasizes phenomenological challenges for technicolor and extended technicolor theories. These arise from two sources: the dangerously large magnitude of flavour-changing neutral interactions in such models and the proliferation of light spin-zero bosons which have not yet been observed. These phenomenological difficulties have been among the motivations for the recently proposed supersymmetric technicolor or supercolour theories. These theories also have interesting phenomenological implications at low energies: for example there should exist spin 1/2 supersymmetric partners of the gluons, called gluinos, which may have masses of a few GeV. There are also startling experimental implications of the strong weak interactions idea: the W^{+-} and Z^0 gauge bosons would be considerably heavier than in the standard model. 45 references.

32759 (SLAC—245, pp 685-698) **Composite quarks and leptons.** Harari, H. (Weizmann Inst. of Science, Rehovot, Israel). Jan 1982. NTIS, PC A99/MF A01.

From Summer institute on particle physics; Stanford, CA, USA (27 Jul 1981).

The possibility that quarks and leptons are composite objects is discussed. The rishon model is studied in detail as an explicit example.

32760 **High-temperature expansion and Monte Carlo simulation of SU(5) gauge theory on a four-dimensional lattice: A comparison.** Drouffe, J.M. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France). Service de Physique Theorique); Moriarty, K.J.M. (Brookhaven National Lab., Upton, NY (USA). Physics Dept.). *Physics Letters, [Section] B;* **105**: No. 6, 449-452(22 Oct 1981).

The high-temperature expansion is derived analytically and compared with Monte Carlo simulation data for a 3^4 and a 4^4 lattice up to the critical temperature. Good agreement is found with an error less than 2% over the whole range considered.

65 PHYSICS RESEARCH

6510 Nuclear Physics

REFER ALSO TO CITATION(S) 32824

32761 **(DOE/ER/05224—5) Research in experimental nuclear physics. Progress report, April 1, 1981-March 31, 1982.** (Texas Univ., Austin (USA). Dept. of Physics). Nov 1981. Contract AS05-76ER05224. 42p. NTIS, PC A03/MF A01. Order Number DE82006839.

Nuclear structure studies using the Energetic Pion Channel and Spectrometer at LAMPF by personnel from the University of Texas at Austin are described; pion elastic and inelastic scattering and pion double charge exchange reactions are utilized. Abstracts and lists of papers presented are given, and a listing of experimental proposals is included. (WHK)

32762 **(INS-NUMA—18) Workshop report of nuclear physics to be studied by NUMATRON accelerator.** (Tokyo Univ., Tanashi (Japan). Inst. for Nuclear Study). Feb 1980. vp. (In Japanese). (CONF-791275—). NTIS (US Sales Only), PC A07/MF A01. Order Number DE82780216.

From Workshop on nuclear physics to be studied by NUMATRON accelerator; Tokyo, Japan (7 Dec 1979).

The papers presented were entered in the data base separately. (WHK)

32763 **(JAERI-M—8769) Proceedings of the 1979 seminar on nuclear data.** Tamura, T.; Matumoto, Z.; Ohshima, M. (eds.) (Japanese Nuclear Data Committee, Tokai, Ibaraki). (Japan Atomic Energy Research Inst., Tokyo). Mar 1980. vp. (In Japanese). (CONF-791243—). NTIS (US Sales Only), PC A13/MF A01. Order Number DE82780217.

From Japanese Nuclear Data Committee nuclear data workshop; Tokai-mura Ibaraki-ken, Japan (10 Dec 1979).

The papers presented were entered in the data base separately. (WHK)

32764 **(KFK—3051) Progress report of the Teilinstitut Nukleare Festkoerperphysik of the Institut fuer Angewandte Kernphysik from June 1st, 1979 to May 31st, 1980.** Jung, V.; Oestreich, V. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Inst. fuer Angewandte Kernphysik 1). Dec 1980. 154p. NTIS (US Sales Only), PC A08/MF A01. Order Number DE82780255.

Separate abstracts are presented for each of the papers included in the data base.

6511 Experimental Techniques

32765 **(IAE—3363/7) ATOS-the installation for atom collision investigation.** Belyaev, V.A.; Dorovskii, A.P.; Dubrovin, M.M.; Lazareva, G.A.; Sokolov, N.I.; Tereshkina, L.G.; Khlopkin, A.N.; Shurov, O.A. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Atomnoj Ehnergii). 1980. 35p. (In Russian). NTIS (US Sales Only), PC A03/MF A01. Order Number DE82700440.

The design and experimental possibilities of the ATOS installation created for carrying out complex investigations in the

field of atom collision physics are described. The installation is based on the principle of joint overtaking beams. Structurally the installation consists of two independent parts, ATOS-1 and ATOS-2 with independent power supply and vacuum service. The ATOS-1 system comprises: an ion source a lens system of ion extraction and ion beam shaping a magnet-monochromator, neutralization chamber, high vacuum measuring chamber comprising systems of beam jointing and analysis of changing their mass and charge composition, a system of the analysis of neutral particles beam, a detector of effect ions. ATOS-2 constitutes a multicharged ion source, lens system, a system of correcting electrodes, a magnet-monochromator and an ion receiver. The installation can be used for studying the atom and molecule interaction with various charge ions in the energy range from electrovolt parts up to 40 keV.

6512 Nuclear Properties And Reactions, A=1-5

REFER ALSO TO CITATION(S) 32725, 32804

32766 **(JINR—18-80-540) Study on the neutron yield from thick targets under the action of 645 MeV protons.** Serov, A.Ya.; Sychev, B.S.; Cherevatenko, E.P. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Problems). 1980. 12p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700204.

The investigation of secondary neutron yield from thick targets exposed to the 645 MeV proton beam has been made with the aim to determine optima conditions for the formation of therapeutical neutron high energy beam of JINR Nuclear Problems Laboratory. The calculations have been carried out using the computer program CASC-2, realizing the successive collisions method in cylindrical geometry. The differential cross sections of secondary nucleon formation have been determined using the computer program D2N2. The targets from Be, C, Al, Fe, Cu, Pb in thickness from 5 to 200 g/cm^2 are considered. The distinction between the compared calculated and experimental data does not exceed 20%. The results obtained can be used in initial information for the study of LET distribution and dose field of the neutron high energy beam in tissue-equivalent fantom when the conditions of radiobiological experiments are modelled and their results are interpreted.

32767 **Coupled-channels treatment of the positive-parity resonances in ^{4}He.** Ramavataram, S. (Oak Ridge National Lab., TN (USA)); Do Dang, G. (Paris-11 Univ., 91 - Orsay (France). Lab. de Physique Theorique et Hautes Energies). *Zeitschrift fuer Physik [Sektion] A: Atoms and Nuclei;* **298**: No. 3, 225-234(1980).

The coupled-channels formalism, which has been previously applied successfully to interpret the negative-parity resonances in ^{4}He, has now been extended to the positive-parity 2hω resonances in this system. The 1p-1h approach has been modified to include coupling to the 2p-2h configurations, which also belong to 2hω excitations, by using the effective operator formalism. The effect of the Pauli term in the s-wave channel is examined and is found to be important in reproducing the 0^+, T = 0 resonance energy and width. Resonances with spins up to Jsup(π) = 3^+ have been studied, and the agreement with available data is satisfactory. In particular, from the good fit to the asymmetry coefficient β(E), one establishes the presence of a 2^+, T = 0 resonance around 35-MeV excitation in the system.

6513 Nuclear Properties And Reactions, A=6-19

REFER ALSO TO CITATION(S) 32767, 32777

32768 **(IFUSP-P—244) Low angular-momentum-cutoff in statistical heavy-ion processes.** de Toledo, A.S.; Hussein, M.S. (Sao Paulo Univ. (Brazil). Inst. de Fisica). Nov 1980. 16p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700197.

Effects arising from the existence of lower-l cutoff (l sub(min)) in Heavy-Ion fusion processes are discussed within the framework of the statistical theory. Both the fluctuation cross-section as well as the angular cross-correlation function are seen to be qualitatively affected by l sub(min).

6514 Nuclear Properties And Reactions, A=20-38

REFER ALSO TO CITATION(S) 32766, 32777, 32778

32769 **(IFUSP-P—249) Contribution of quasi-elastic processes to the total reaction cross-section of heavy ions.** Acquadro, J.C.; Hussein, M.S.; Pereira, D.; Sala, O. (Sao Paulo Univ. (Brazil). Inst. de Fisica). Dec 1980. 7p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700200.

A simple estimate of the ratio of the total quasi-elastic cross-section to the total reaction cross section of heavy ions made and compared to the experimentally deduced for the ^{16}O+^{27}Al system. The slow energy dependence of the ratio is stressed.

6515 Nuclear Properties And Reactions, A=39-58

REFER ALSO TO CITATION(S) 32766

32770 **(NEANDC(J)—80/U) Evaluation of neutron nuclear data for ^{45}Sc.** Oka, Y.; Nakagawa, T.; Kikuchi, Y. (Japan Atomic Energy Research Inst., Tokai, Ibaraki. Tokai Research Establishment). Feb 1982. 64p. (INDC(JAP)—67/L; JAERI-M—9981). Information Section, Division of Technical Information, Japan Atomic Energy Research Institute, Tokai-mura, Naka-gun, Ibaraki-ken 319-11, Japan.

Portions of document are illegible.

Evaluation of neutron nuclear data for ^{45}Sc was performed in the energy range of thermal to 20 MeV. Evaluated quantities are the total, elastic and inelastic scattering, capture, (n,2n), (n,p) and (n,α) reaction cross sections, resonance parameters and angular distributions of emitted neutrons. Resonance parameters are recommended below 100 keV. Particular care was paid for the minimum value of the total cross section near 2 keV, since a mono-energetic neutron filter is now under design by using scandium metal at Fast Neutron Source Reactor YAYOI of The University of Tokyo. Optical and statistical model calculations are performed for the smooth cross sections above resonance region. The results were compiled in the ENDF/B format and they will be stored in the second version of Japanese Evaluated Nuclear Data Library JENDL-2.

6516 Nuclear Properties And Reactions, A=59-89

REFER ALSO TO CITATION(S) 32766

32771 **(JINR-R—15-80-786) Intermediate structure in proton resonances.** Bykov, A.A.; Kraft, O.E.; Naumov, Yu.V.; Petrov, B.F.; Sigalov, V.M.; Sizov, I.V. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Neutron Physics). 1980. 10p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700225.

The new method of intermediate structures search based on the analysis of signs of values of delta multipolarity mixtures for resonance gamma-decay is suggested. Resonances in ^{61}Cu have been excited in the ^{60}Ni(p, γ)^{61}Cu reaction at proton energies in the 1570-1850 keV range. ^{60}Ni targets (95% of enrichment) had the 10-20 μg/cm^2 thickness. Gamma radiation has been detected by Ge(Li)-detector of 40 cm^3 volume with 8 keV energy resolution for gamma-lines with 7 MeV energy. At given proton energy gamma-spectra have been measured under 0, 3a deg, 60 deg, 90 deg angles to the direction of the incident beam. The proton beam intensity and integral intensity of gamma rays detected by the NaI(Tl) crystal are determined. Experimental data on energies and spins of observed resonances are given. The value and sign of delta are determined from analysis of angular distribution of gamma-transitions through the resonance in the (p, γ) reaction. Analysis of delta sign shows, that there is intermediate structure for the $3/2^-$ resonances in the ^{60}Ni(p, γ)^{61}Cu reaction. The intermediate structure is interpreted as a distribution of the strength of the giant Gamov-Teller resonance over the resonance states of a more complicated structure. An assumption on Gamma-Teller type of observed inlet state satisfactory explains the existing experimental data.

6517 Nuclear Properties And Reactions, A=90-149

REFER ALSO TO CITATION(S) 32811

32772 (IAE—3313/1) Interference effects in Moessbauer spectra of M1-transitions. Peregudov, V.N. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Atomnoj Ehnergii). 1980. 20p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700192.

The purpose of the study is the calculation of interference effects in Moessbauer spectra of the (γ, e) reaction. Two channels of the inelastic (γ, e) reaction are considered: resonance gamma radiation absorption by nucleus accompanied by internal conversion and photo absorption by atomic electrons. The case of M1 nuclear transition multipolarity is considered. The expression for angular dependence coefficients of interference member is obtained. General expression for (γ, e) reaction cross section is obtained in a long-wave approximation for the case when the specimen is placed in longitudinal magnetic field involving superfine nuclear level splitting. The results of disperse amplitudes calculation for ^{90}Kr, ^{119}Sn, ^{129}I, ^{149}Sm, ^{181}Eu, ^{169}Tm, ^{183}W, ^{193}Ir, ^{197}Au nuclei are verified. The calculations show that maximum interference effect in the (γ, e) reaction should be expected for ^{169}Tm isotope.

32773 (IFUSP-P—225) Charge-exchange Gamow-Teller and dipole resonances in ^{90}Zr. Krmpotic, F. (Sao Paulo Univ. (Brazil). Inst. de Fisica). Jul 1980. 21p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700194.

The charge-exchange resonances in ^{90}Zr are discussed within the framework of a simple model. Recent experimental results are confronted with corresponding theorical estimates.

32774 (IFUSP-P—246) Energy splitting between the $T=T_0$ and $T=T_0$-1 components of the charge-exchange vector dipole resonance. Krmpotic, F. (Sao Paulo Univ. (Brazil). Inst. de Fisica). Nov 1980. 11p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700199.

Recent experimental data for the energy splitting between the $T=T_0$ and $T=T_0$-1 components of the charge-exchange-vector-dipole resonance are discussed within the framework of a simple model.

32775 (INS—398) Phenomenological optical potentials of heavy ions. Kubono, S. (Tokyo Univ., Tanashi (Japan). Inst. for Nuclear Study). Jan 1981. 28p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE82700218.

This report summarizes recent experimental studies of heavy ion interactions through elastic scattering, inelastic scattering and transfer reactions. The large cross sections at far back angles observed in elastic scattering of even-even nuclei (^{12}C, ^{16}O, ..., ^{28}Si, ..., ^{40}Ca) are roughly explained by using optical potentials which are transparent at the strong-absorption-radius region. The mass number dependence of the constant-cross-section regions which appear in the 180° excitation functions are also explained by a surface-transparent potential set with slight energy dependence. However, the structure seen at 90° and 180° can be simultaneously explained only by a parity-dependent potential, although the physical significance of the term seems unclear yet. The α-transfer reactions also suggest a common isolated doorway state will be ruled out for the gross structures. The channel coupling effects of a strong inelastic scattering was included approximately by modifying the imaginary term. However, when strong Coulomb excitation dominates the inelastic scattering, the optical potential needs to have a new term of long range absorption. Heavy-ion spin-orbit term was studied through transfer reactions and inelastic scatterings, giving the order of V sub(so) = 0.7 - 3 MeV for the ^{13}C, ^{15}N and ^{19}F potentials.

32776 (JAERI-M—9714) PROFP-Y: a computer code for producing nuclear data library of fission products. Ihara, H.; Matumoto, Z.; Tasaka, K.; Nakasima, R.; Akiyama, M.; Yoshida, T. (Japan Atomic Energy Research Inst., Tokai, Ibaraki. Tokai Research Establishment). 10 Sep 1981. 138p. (In Japanese and English). (NEANDC(J)—74/AU; INDC(JAP)—61/G). NTIS (US Sales Only), PC A07/MF A01. Order Number DE82901989.

A Computer code PROFP-Y has been developed to prepare the input data of the DCHAIN and FPGS codes, which analyze buildup and decay of fission products. The PROFP-Y consists of various function modules such as data edition, replacement, addition, retrieval, graphical representation of decay chain diagram, coupling of data with those of JNDC FP Decay Data File, and calculation of fission yields, etc. These are conveniently selected for user's requirement. The code has been used for producing the input data library of DCHAIN, which includes nuclear decay and fission yield data of 1172 nuclides. The nuclear decay data has been taken from JNDC FP Decay Data File compiled by Working Group on Evaluation of Decay Heat in Japanese Nuclear Data Committee. Most of the fission yields of newly added nuclides and newly reported isomers were calculated with the present code. This code can be successfully applied to sensitivity analysis of decay heat for theoretically estimated values and reevaluation work with new experimental data because of the facilities of quick revision and error checking of the library.

32777 (JINR—E-1-80-799) Hadron-nucleon inelastic collision mean free path in nuclear matter. Strugalski, Z. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of High Energy). 1980. 15p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700205.

Characteristics of atomic nuclei, used as targets in high energy hadron-nucleus collision experiments, are defined on the basis of the data on the nuclei sizes and radial nucleon density distributions in nuclei. Average mean free path for inelastic hadron-nucleon collisions in nuclei is estimated using existing experimental data on the pion-xenon nucleus collisions and the connection of it with the cross-section for hadron-nucleon elementary inelastic collisions is discussed.

32778 (JINR—E-1-81-154) Hadron-nucleus collisions. Pt. 1. Picture, description procedure, cross-sections. Strugalski, Z. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of High Energy). 1981. 14p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700206.

Qualitative picture of high energy hadron-nucleus collision process, emerging from the analysis of experimental data, is presented. Appropriate description procedure giving a possibility of reproducing various characteristics of this process in terms of the data on elementary hadron-nucleon interaction is proposed. Formula reproducing hadron-nucleus collision cross sections is derived. Inelastic collision cross sections for pion-nucleus and proton-nucleus reactions at wide energy interval are calculated for Pb, Ag, and Al targets. A-dependence of cross sections for pion-nucleus and proton-nucleus collisions at nearly 50 GeV/c momentum were calculated and compared with existing experimental data. Energy dependence of cross sections for hadron-nucleus collisions is determined simply by energy dependence of corresponding cross sections for hadron-nucleon collisions; A-dependence is determined simply by nuclear sizes and nucleon density distributions in nuclei.

32779 (JINR-R—3-80-779) Study on the (n, α) reactions on ^{147}Sm, ^{149}Sm, ^{143}Nd isotopes at 2 keV neutron energy using Sc filtered beam. Andrzejewski, J.; Vertebnyj, V.P.; Vo Kim Tkhan; Vtyurin, V.A.; Dolgov, V.A.; Kirilyuk, A.L.; Popov, Yu.p. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Neutron Physics). 1980. 8p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700227.

Alpha spectra from the (n, α), reaction on ^{147}Sm, ^{149}Sm, ^{143}Nd were measured using Sc filtered beam. Cross sections for ^{149}Sm and ^{143}Nd to be 13.4+-5 μb and 42.2+-4.3 μb, respectively, were measured. The validity was confirmed of the statistical theory about the constancy of α-widths for ^{147}Sm and ^{149}Sm. The relation

between reduced probabilities of α-transitions to the first excited state and to the ground state of the daughter ^{144}Nd nucleus does not contradict with the statistical theory. However one cannot exclude a possibility of a weak (by a factor of approximately 1.5) enhancement of α-transitions to the excited state as compared with that to the ground state.

32780 (JINR-R—6-81-23) ^{149}Dy beta decay and ^{149}Tb excited states. Zuber, K.; Tsupko-Sitnikov, V.M.; Prazhak, F. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Problems). 1981. 4p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700229.

The β^+-decay of ^{149}Dy (Tsub(1/2)=4.6 min) was studied using separated sources obtained on the YASNAPP facility. By means of semiconductor detectors gamma-gamma coincidence spectra were measured. A decay scheme including 19 excited states of ^{149}Tb is proposed. As compared to earlier paper, 14 new levels are introduced into the ^{149}Dy decay schemes and the existence of levels of 876, 1095, 1196 and 1098 keV energies is not confirmed.

32781 (KFK—2974) Isotope shifts in unstable nuclei. Rebel, H. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Inst. fuer Angewandte Kernphysik 2). May 1980. 42p. (CONF-8004194—1). NTIS (US Sales Only), PC A03/MF A01. Order Number DE82780285.

From Conference on trends in nuclear structure physics; Manchester, UK (16 Apr 1980).

Current experimental investigations of isotope shifts in atomic spectra of unstable nuclei and the resulting information about size and shape of nuclei far off stability are discussed with reference to some representative examples.

32782 (UTTAC—38) Direct experimental evidence for strong sequential two-step transfer process in allowed (p,t) reactions. Kunori, S.; Aoki, Y.; Iida, H.; Nagano, K.; Toba, Y. (Tsukuba Univ., Sakura, Ibaraki (Japan). Tandem Accelerator Center). 1980. 13p. (NSSRP—38). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700235.

A marked difference of (p,t) analyzing powers for the two isotones in N = 52 → 50 ground-state transitions was observed between two reactions ^{92}Zr (p,t) and ^{94}Mo (p,t). The difference is not explained by direct one-step processes but is interpreted by including strong two-step (p,d) (d,t) processes. Interference between the two processes of comparable intensities is essential. Drastic incident-energy dependence of the analyzing powers is also interpreted only by including the two-step processes.

6518 Nuclear Properties And Reactions, A=150-189

REFER ALSO TO CITATION(S) 32772

32783 (JINR-R—3-81-19) Parameters of osmium neutron resonances in 6 - 60 eV range. Popov, A.B.; Trzeciak, K. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Neutron Physics). 1981. 7p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700228.

Transmissions of samples of natural osmium under good resolution are measured using the Neutron Physics Laboratory neutron spectrometer. Parameters of neutron resonances of osmium within the 60 eV region are determined by the form method. These are compared with other data. The average radiative width values are obtained: GITAsub(γ)=92+-6 and 93+-3meV for ^{187}Os and ^{189}Os, respectively.

32784 (JINR-R—4-81-148) Collective two-phonon states in deformed nuclei. Solov'ev, V.G.; Shirikova, N.Yu. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics). 1981. 19p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700214.

The centroid energies of the two-phonon states in doubly even deformed nuclei are calculated within the quasiparticle-phonon nuclear model taking into account the Pauli principle in the two-phonon components of the wave functions. On the example of ^{154}Gd, ^{160}Dy, ^{168}Er, ^{230}Th and ^{240}Pu nuclei it is shown that the collective two-phonon energies are shifted by 1-2 MeV due to the Pauli principle. A strong fragmentation of the two-phonon collective states over many nuclear levels occurs at the excitation energies of 3-4 MeV. It is concluded that the two-phonon states are absent in deformed nuclei. The analysis of the available experimental data on the two-phonon states shows that the experimental data do not contradict the results of these calculations.

32785 (JINR-R—4-81-243) Probability of E1-transition taking into account anharmonicity for ^{176}Hf in neutron binding energy range. Kitipova, V. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics). 1981. 6p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700215.

The influence of the anharmonicity on the strength function of the E1-transition reduced probability near the neutron binding energy is investigated. The consideration is performed in the frame of the quasiparticle-phonon model. The strength function method is employed in the calculations. The results show the weak influence of the anharmonicity over the strength function form. The influence of the giant dipole resonance on the strength function in the energy interval 5.5-9 MeV is investigated. It is shown how this influence must be taken into account. The radiative reduced widths are calculated.

32786 (JINR-R—15-81-151) Resonance scattering of 3-5 MeV γ-quanta emitted at radioactive decay. Gangrskii, Yu.P.; Zhuchko, V.E.; Miller, M.B.; Mikhajlov, L.V.; Kharisov, I.F. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Reactions). 1981. 5p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700226.

The scattering of γ-radiation on ^{238}U and ^{181}Ta nuclei which is emitted at radioactive decay of ^{66}Ga, ^{74}Br and ^{142}La isotopes was studied. For ^{74}Br and ^{66}Ga the scattering of a series of γ-quanta within the 3-5 MeV energy range was observed with anomalously high cross section (up to 10^{-26} cm^2). This is due to the resonance excitation of ^{238}U and ^{181}Ta nuclear levels by γ-quanta haviang a big Doppler broadening (up to 300 eV) because of the motion of a recoil nucleus after the β-decay.

6519 Nuclear Properties And Reactions, A=190-219

REFER ALSO TO CITATION(S) 32766, 32772, 32774, 32777, 32778

32787 (DOE/ER/03346—T1) Nuclear chemistry research and spectroscopy with radioactive sources. Seventeenth annual progress report. Fink, R.W. (Georgia Inst. of Tech., Atlanta (USA). School of Chemistry). 31 Jul 1981. Contract AS05-76ER03346. 27p. (ORO—3346-244). NTIS, PC A03/MF A01. Order Number DE82004631.

Current results fall into two categories: those problems which are largely completed and are in preparation for journal publication (decay of /sup 201m,g/Po); lifetimes of g/sub 7/2/ intruder states in ^{109}Ag; orbital electron capture ratios and decay energy of ^{207}Bi and those problems which are in the midst of active or initial investigation (decay of /sup 187m,g/Au, decay of ^{201} ^{203}At; decay of ^{135}Ba; and IBFA model computations). Results are presented and discussed. (WHK)

32788 (IFUSP-P—245) Equations of motion for nuclear particle-particle excitations and the interacting boson model. Galeao, A.P.N.R.; Chen, C.H.T. (Sao Paulo Univ. (Brazil). Inst. de Fisica). Nov 1980. 14p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700198.

Equations of motion for correlated nucleon pairs are derived and then applied to some even lead isotopes. The connexion with the interacting boson model is pointed out.

32789 (INIS-mf—6825) Elastic scattering of monochromatic photons at the atomic nucleus of ^{208}Pb in and above the dipole giant resonance. Hammen, M. (Mainz Univ. (Germany, F.R.). Fachbereich Physik). 23 May 1980. 53p. (In German). NTIS (US Sales Only), PC A04/MF A01. Order Number DE82780193.

Thesis.

Within the framework of this work, a scattering arrangement has been set up enabling the determination differential cross-sections also at energies above the giant resonance region. The system set up at the Mainz electron linear accelerator to produce a beam of high-energy positrons and their annihilation in flight, was used as photon source. Special care was taken when reducing interfering background radiation, therefore it was necessary to improve the structure of the photon source at several points. The absolute values of the cross-sections for 60° and 150° scattering angle in the energy region of 14.4 and 30 MeV were determined for the first time on ^{208}Pb as result of these improvements. It was shown that these measruements provide results which agree within their statistic and systematic errors with measurements of the (\,xn) cross-sections. The influence of the nuclear charge distribution is made clear by the measurements. (orig./HSI).

32790 (JINR-R—7-12061) Study on the ^{48}Ca ion fusion with sup(203,205)Tl, sup(208)Pb and sup(209)Bi nuclei. Orlova, O.A.; Brukhertzajfer, Kh.; Muzychka, Yu.A.; Oganesyan, Yu.Ts.; Pustyl'nik, B.I.; Ter-Akop'yan, G.M.; Chepigin, V.I.; Choj Val Sek. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Reactions). 1978. 15p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700232.

Integral yields of ^{246}Cf and some fermium isotopes: (^{253}Fm+^{255}Fm) and ^{254}Fm were measured in the complete fusion reactions bombarding by ^{48}Ca ions ^{208}Pb, ^{209}Bi and sup(203, 205)Tl targets. The irradiation has been performed on the internal cyclotron beam. The ^{48}Ca ion energy has been changed by shifting targets by the radius and constituted in the Bi, Pb, Tl reactions 236, 224 and 223 MeV, respectively with 2.5%-spread. The targets represent metallic layers of ^{208}Pb, ^{209}Bi or sup(203, 205)Tl of 1.6 mg/cm^2, 3.8 mg/cm^2 and 2.6 mg/cm^2, thickness respectively applied to thick aluminium substrates cooled by water. The target has been placed at 20 deg angle to the beam direction which makes possible to decrease energy release for square unit approximately three times. Integral reaction product yields are measured, excitation functions of which are situated in the interval from the maximum beam energy up to the fussion reaction barrier. ^{246}Cf isotope yields (Esub(α)=6.76 MeV), ^{254}Fm(Esub(α)=7.18 MeV) as well as ^{253}Fm(Esub(α)=7.04 MeV) and ^{255}Fm(Esub(α)=7.01 MeV) are determined by α-lines which have been identified by α-particle energy and half decay period. For ^{253}Fm and ^{255}Fm total yields are measured. Detected isotopes of californium and fermium were decay products of evaporated residues of reactions (^{48}Ca, xn), and their yields were calculated by using ALICE computer program. A rather good agreement of calculated results with measured experimental yields was obtained.

32791 (UTTAC—39) Strong sequential transfer processes in $O^+ \rightarrow O^+$ (p,t) reactions on Pb isotopes. Toba, Y.; Aoki, Y.; Iida, H.; Kunori, S.; Nagano, K. (Tsukuba Univ., Sakura, Ibaraki (Japan). Tandem Accelerator Center). 1980. 14p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700236.

A marked difference of experimental analyzing powers A (theta) for ^{208}Pb (polarized p,t) ^{206}Pb (O sub(g)sup(+) and O_2^+) reactions is explained by considering the sequential transfer processes as well as the one-step one. The calculated A (theta) for the O_2^+ state is very sensitive to the wave functions employed. An enhancement of the cross sections for the ground-state transitions of three Pb isotopes are found due to the sequential transfer processes.

6520 Nuclear Properties And Reactions, A=220 And Above

REFER ALSO TO CITATION(S) 32228, 32234, 32776, 32784, 32786

32792 (JINR-R—7-12054) Experiments on the fusion of element 108 in the ^{226}Ra+^{48}Ca reaction. Oganesyan, Yu.Ts.; Ter-Akop'yan, G.M.; Pleve, A.A. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Reactions). 1978. 15p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700230.

The experiments have been conducted on the cyclotron internal beam. The ^{48}Ca ion beam of 2x10^{11} ion/s intensity dropped on the ^{226}Ra target (0.5 mg/cm^2) applied in the form of RaF_4 by the method of vacuum evaporation to the nickel substrate (0.89 mg/cm^2). The ^{48}Ca ion energy in the centre of Ra layer constitutes 236 MeV which corresponds to the calculational maximum of reaction cross section (3n). It is pointed out that the problem on cross sections of the ^{226}Ra (^{48}Ca, xn) reaction cannot be considered as a definite one. Obviously experiments with a higher sensitivity (up to delta approximately 10^{-36} cm^2) should be performed. The extracted ^{48}Ca ion beam being essentially of a higher intensity than the used one, allows to considerably increase the speed of response and sensitivity of the experiments on the fusion of element 108 and that of heavier elements.

32793 (JINR-R—7-12056) Spontaneous fission of heavy isotopes of nielsbohrium (Z=105) and element 106. Druin, V.A.; Bochev, B.; Lobanov, Yu.V. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Reactions). 1978. 15p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700231.

The nuclear reactions ^{249}Bk(^{18}O, 5n) and ^{249}Cf(^{18}O, 4n) have been used to produce the heavy isotopes of nielsbohrium, ^{263}Ns, and element 106, ^{263}106, which undergo spontaneous fission with high probabilities (-60 % and -70 %, respectively). Together with the available data on other isotopes of elements 105 and 106, the results obtained indicate that the dependence of spontaneous fission half-lives on neutron number for elements heavier than kurchatovium (Z=104) is similar to that established for kurchatovium isotopes.

32794 (JINR-R—15-80-762) Duration of ^{238}U fission induced by ^{3}He. Bugrov, V.N.; Karamyan, S.A. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Reactions). 1980. 14p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700224.

The shadow effect in angular distribution of fission fragments is observed and shadow minima are quantitatively studied in irradiations of monocrystalline UO_2 target by the ^{3}He ion beam with the 25, 31, 40, 47 MeV energy. The measured values of the difference of the shadow minima depths Achi show the significant time duration of the fission events which exceeds the result of model calculation taking into account many chances of fission after neutron emission. The behaviour of the life-time function in dependence on the excitation energy for a compound nucleus is discussed.

32795 (LA—9026) E2 isovector giant resonance as seen through the capture of fast neutrons. Drake, D.M.; Aniol, K.; Halpern, I.; Joly, S.; Nilsson, L.; Storm, D.; Wender, S.A. (Los Alamos National Lab., NM (USA)). Nov 1981. Contract W-7405-ENG-36. 6p. NTIS, PC A02/MF A01. Order Number DE82007357.

The forward-to-backward asymmetry of high-energy photons, emitted in the radiative capture of neutrons with energies up to 20 MeV, was measured for ^{208}Pb. The asymmetry increases abruptly from small values to large ones near Eγ ~ 23 MeV, supporting the location in that neighborhood of the E2 giant isovector resonance.

6530 Nuclear Theory

REFER ALSO TO CITATION(S) 32606, 32606, 32775, 32811

32796 **(IFUSP-P—206) Collective motion and the generator coordinate method.** de Passos, E.J.V. (Sao Paulo Univ. (Brazil). Inst. de Fisica). Apr 1980. 17p. (CONF-800155—2). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700193.

From 6. Brazilian symposium on theoretical physics; Rio de Janeiro, Brazil (7 Jan 1980).

The generator coordinate method is used to construct a collective subspace of the many-body Hilbert space. The construction is based on the analysis of the properties of the overlaps of the generator states. Some well - known misbehaviours of the generator coordinate weigth functions are clearly identified as of kinematical origin. A standard orthonormal representation in the collective sub space is introduced which eliminates them. It is also indicated how appropriate collective dynamical variables can be defined a posteriori. To illustrate the properties of the collective subspaces applications are made to a) translational invariant overlap kernels b) to one-and two-conjugate parameter families of generator states.

32797 **(IFUSP-P—240) Interacting sp-boson model with isospin: an unified description of giant multipole resonances and other collective motions.** Chen, C.H.T. (Sao Paulo Univ. (Brazil). Inst. de Fisica). Oct 1980. 15p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700195.

A unified description of the following classes of nuclear collective states in terms of an interacting sp-boson model is proposed: (i) Low-lying collective states in the light nuclei, both odd-odd and even-even; (ii) Giant multipole resonances (GMR), and (iii) pairing collective motions.

32798 **(INIS-mf—6798) Generation and scaling behaviour of high-energy pions in relativistic heavy ion reactions.** Riess, F. (Technische Hochschule Darmstadt (Germany, F.R.). Fachbereich Physik). Dec 1979. 91p. (In German). NTIS (US Sales Only), PC A05/MF A01. Order Number DE82780192.

Thesis.

Calculations with the help of a collision approximation as carried out in this study, are certainly linked with many uncertainties. The different forms of pulse distributions and cross sections used cover however such a broad region of possibilities, that even detailed calculations will not give any results essentially deviating from those obtained here. The various assumptions and statements could be relatively easily investigated using the collision approximation. Hence the above-mentioned aim, to pick out the principal information from the statement is achieved. It was shown that taking the two assumptions - nucleon-nucleon collisions only and - consideration of a cluster effect, in both cases the experimental results for a given reaction can be well reproduced as long as one only regards one projectile energy. It is important in the first case that the pulse distribution in the region of 0,5 to 1 GeV/c contains sufficiently large components - a simple Gauss distribution with a 'normal' parameter from nuclean physics is not sufficient here. The cluster statement provides the high-energy pions through the changed kinematics, compared to pure nucleon-nucleon collisions, and through the greater energy provided by a cluster in the reaction. (orig./HSI).

32799 **(ITEP—13(1981)) Scattering integral equations and four-nucleon problem. Integral equations for Weinberg quasiparticles.** Narodetsky, I.M. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Teoreticheskoj i Ehksperimental'noj Fiziki). 1981. 75p. NTIS (US Sales Only), PC A04/MF A01. Order Number DE82700203.

This is the second part of the paper in which existing results from the application of integral technique to the four-nucleon bound states and scattering are reviewed. The purpose of this review is to provide a clear and elementary introduction in the integral equation method and to demonstrate its usefulness in physical applications. The presentation is based on the quarsiparticle appoach. This permits a simple interpretation of the equation in terms of quasiparticle scattering. The mathematical basis for the quasiparticle approach is the Hilbert-Schmidt method of the Fredholm integral equation theory. The first part of this review contains a detailed discussion of the Hilbert-Schmidt expansion as applied to the two-particle amplitudes which are the kernels of the three-body equations.The second part contains the discussion of the three- and four-body quasiparticle equations.

32800 **(JINR-R—2-80-774) Cascade-exciton model of nuclear reactions. Model formulation.** Gudima, K.K.; Mashnik, S.G.; Toneev, V.D. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics). 1980. 18p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700212.

A phenomenological approach combining essential features of the exciton and intranuclear cascade models is developed. Basic equations of the cascade-exciton model which are solved by the Monte-Carlo method are presented. The sensitivity of the results with respect to input parameters of the model are discussed. The model is applicable to calculating various characteristics of hadron-nuclear reactions in the energy range from ten MeV up to several GeV.

32801 **Variation of βR with probe in inelastic hadron scattering and adequacy of first-order calculations.** Bernstein, A.M. (Massachusetts Inst. of Tech., Cambridge (USA). Dept. of Physics); Brown, V.R.; Madsen, V.A. (California Univ., Livermore (USA). Lawrence Livermore National Lab.). *Physics Letters,* [*Section*] *B;* **106**: No. 4, 259-263(12 Nov 1981).

The predicted probe dependence of the collective parameter delta = βR, obtained from distorted wave analyses of inelastic scattering data, is shown to have been observed for a variety of hadrons from low to intermediate energies for $0^+ \rightarrow 2^+$ transitions in single-closed-shell nuclei. These results, when compared to electromagnetic data, show an internal consistency which provides both a check of the validity of the first-order reaction mechanism as well as a determination of the relative neutron to proton transition matrix elements to approx. equal to 15% accuracy. The empirically determined systematic variation of neutron and proton transition strengths are in agreement with a schematic calculation of core polarization.

32802 **Calculation of muon final probabilities after muon-induced fission in a four-state basis.** Ma, Z.; Wu, X.; Zhang, J.; Zhuo, Y. (Academia Sinica, Beijing (China). Inst. of Atomic Energy); Rasmussen, J.O. (California Univ., Berkeley (USA). Lawrence Berkeley Lab.). *Physics Letters,* [*Section*] *B;* **106**: No. 3, 159-162(5 Nov 1981).

Our earlier theoretical work on the relative muon capture between heavy and light fission fragments is extended by including 2 psigma states as well as 1 ssigma states. We calculate about 0.8% population of the 2 p state in the heavy fragment with negligible change from our earlier two-state basis regarding the 1 s population of light and heavy fragments.

32803 **Global analysis of relativistic heavy-ion collisions.** Kapusta, J.; Strottman, D. (Los Alamos Scientific Lab., NM (USA). Theoretical Div.). *Physics Letters,* [*Section*] *B;* **106**: No. 1/2, 33-37(29 Oct 1981).

A global analysis of relativistic heavy-ion collisions is proposed which entails a measurement of the momentum of all emitted particles. The resultant thrust is a measure of final-state momentum flow and provides information on the global dynamics governing the collisions. This proposal is tested with a relativistic hydrodynamic model for collisions of equal-mass nuclei. The angle at which the thrust, or maximal directed momentum flow, occurs is 0° CM for grazing collisions and increases monotonically to 90° CM for central collisions. Experimental observation of this dramatic behaviour would imply a mean free path much less than the size of the colliding nuclei.

32804 (IFUSP-P—241) Study of the relationship between the semi-classical and the generator coordinate methods. de Passos, E.J.V.; de Souza Cruz, F.F. (Sao Paulo Univ. (Brazil). Inst. de Fisica). [nd]. 41p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE82700196.

Using a very simple type of wave-packet which is obtained by letting unitary displacement operators having as generators canonical operators Q and P in the many-body Hilbert space act on a reference state, the relatinship between the semi-classical and the generator coordinate methods is investigated. The semi-classical method is based on the time-dependent variational principle whereas in the generator coordinate method the wave-packets are taken as generator states. To establish the equivalence of the two-methods, the concept of redundancy of the wave-packet and the importance of the zero-point energy effects are examined in detail, using tools developed in previous works. A numerical application to the case of the Goldhaber-Teller mode in ^{4}He is made.

6540 Radiation And Shielding Physics

REFER ALSO TO CITATION(S) 32165, 32608, 32840, 32841

32805 (EFI—421(28)-80) Angular distribution of bremsstrahlung γ-quanta. Bayatyan, G.L.; Knyazyan, S.G.; Margaryan, A.T. (Erevanskij Fizicheskij Inst. (USSR)). 1980. 14p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700188.

The calculations of the angular distribution of bremsstrahlung γ-quanta at passage of electrons with the 1.2 and 4.5 GeV energy through the gold radiators of (5.10^{-3}-10^{-1}) rad thickness are given. Both the angular distribution of bremsstrahlung radiation and the electron multiple scattering in the radiator are taken into account. The Monte-Carlo technique is used. The calculations agree with the Lanzl and Hanson calculations and describe experimental data well.

32806 (EFI—431(38)-80) Multiple scattering in thin layers of substance. Margaryan, A.T. (Erevanskij Fizicheskij Inst. (USSR)). 1980. 12p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700189.

Successive collisions of multiple scattering were simulated by the Monte-Carlo method. The multiple scattering probability distribution function obtained in such means is valid also when the mean number of collisions in the substance layer is less than 20. The results of calculations when passing electrons with the 16.21 MeV energy through the gold foils with 4.08, 2.72, 2.04, 1.36, 0.68 and 0.34 mg/cm^2 thickness are given. Satisfactory agreement with the Moliere distribution is obtained.

32807 (FEI—1130) Study on inelastic scattering spectra of slow neutrons in yttrium-aluminium garnet crystals with rare earth additions. Morozov, S.I.; Danilkin, S.A.; Zakurkin, V.V. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Obninsk. Fiziko-Ehnergeticheskij Inst.). 1980. 12p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700091.

To elucidate the mechanism of heat conduction decrease and ultrasound attenuation the variation of the yttrium-aluminium garnet phonon spectrum upon injection in it of paramagnetic ions should be investigated. For this purpose the spectra of inelastically scattered neutrons (ISN) of pure garnet and garnets with additions of paramagnetic rare earth metal Tb and Dy have been measured. For Tb and Dy paramagnetic ions in ISN spectra along with the maxima caused by scattering on oscillation modes peculiarities corresponding to magnetic neutron scattering with energy transfer epsilon=9.4 and epsilon=7.6 MeV for Tb and Dy respectively, have been observed. Upon implantation of the Lu non-paramagnetic, addition the ISN spectrum remained totally similar to the pure garnet spectrum. A slight peculiarity at the energy transfer epsilon=11.5 MeV related to quasilocal oscillations of the Lu heavy addition has been observed. For one-valued interpretation of the present correlation between the rare earth addition implantation and variation, in particular, of ultrasound absorption in different temperature intervals the correct separation of phonon and magnetic scattering is necessary.

32808 (GSI—81-2, pp 140) Stopping power measurements with the modified UNILAC TOF-system. Geissel, H.; Albrecht, R.; Laichter, Y.; Strehl, P.; Klabunde, J. Mar 1981. NTIS (US Sales Only), PC A16/MF A01.

In Scientific report 1980.

32809 (IAE—3261/11) Defect formation in semiconductors under ion bombardment. Martynenko, Yu.V. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Atomnoj Ehnergii). 1980. 27p. (In Russian). NTIS (US Sales Only), PC A03/MF A01. Order Number DE82700092.

Theoretical and main experimental works on the defect accumulation and semiconductor amorphization under the bombardment by ions are reviewed. The dependence of a dose of semiconductor amorphization at low temperature has been obtained. The theory of crystalline defect regions, where defects are held due to the reduction of electron subsystem energy, has been developed. A model for the defect accumulation and semiconductor amorphization explaining temperature dependencesof the amorphization dose for different ions has been created.

32810 (IFVE-OP—81-17) Effect of electron beam parameters on the coherent bremsstrahlung in monocrystals. Maisheev, V.A.; Frolov, A.M. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov. Inst. Fiziki Vysokikh Ehnergij). 1981. 16p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700095.

The approximate formulae in unified variables were derived for cross section and linear polarization of radiation from a set of points in reciprocal lattice of a singleatomic crystal on the basis of the known relations for coherent bremsstrahlung of electrons. The variables take simply into account energy and angular divergence of an electron beam, relative energy of emitted photons, type and angular orientation of a single crystal. Some general tendencies for coherent bremsstrahlung are analyzed. Computed results for silicon and diamond monocrystals at electron energies up to the TeV region are presented.

32811 (INIS-SU—40) Neutron physics. Part 1. Proceeding of the 5. All-union conference on neutron physics. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow; AN Ukrainskoj SSR, Kiev. Inst. Yadernykh Issledovanij). 1980. 340p. (In Russian). (CONF-8009198—(Pt.1)). NTIS, PC A15/MF A01. Order Number DE82780226.

From 5. national Soviet conference on neutron physics; Kiev, Ukrainian SSR (15 Sep 1980).

The papers presented are entered in the data base separately. (WHK)

32812 (JINR—E-17-81-60) Problem of neutron spectroscopy of parametrically nonequilibrium quasiparticles in solids. Pt. 1. Neutron inelastic scattering on polaritons in the parametric resonance conditions. Vo Khong An. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics). 1981. 14p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700096.

The parametric excitation of quasiparticles in solids by high-intensity electromagnetic radiation fields is considered as a method of solving the "small concentration problem" in neutron spectroscopy of such quasiparticles. Using a suitable quantum formalism for the calculation of correlation functions of anomalous fluctuations the analytical expressions for the cross sections of neutron inelastic scattering on polaritons in the parametric resonance conditions are obtained that show an anomalously large increase as the intensity of the driving laser field approaches the parametric excitation threshold.

32813 **(JINR-R—14-80-793) Some peculiarities of the Vavilov-Cherenkov radiation connected with the finite thickness of the radiator.** Kobzev, A.P.; Frank, I.M. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Problems). 1980. 11p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700190.

The properties of Vavilov-Cherenkov radiation (VCR) for radiator of little thickness is analysed. It is shown that radiation directivity, its threshold properties and thickness of the radiator considerably differ from the well known parameters of VCR corresponding to the case of particle endless path in the media. The directivity and energy characteristics of radiation generated by electrons in a mica target 12400 A thick for the 4000 A wave length are experimentally studied. Experimental results agree well with the calculated ones.

32814 **(KAERI/RR—267/80) Study of material science by neutron scattering.** Kim, H.J.; Jeon, B.C.; Lee, C.Y.; Ho, J.H. (Korea Advanced Energy Research Inst., Seoul (Republic of Korea)). 1980. 49p. (In Korean). NTIS (US Sales Only), PC A03/MF A01. Order Number DE82700099.

This report describes the second year's work progress on the development of neutron diffraction method of accurate texture determination, theoretical method of texture analysis and texture-anisotropy correlation analysis. Experimental pole figures are studied for oriented silicon steel and cold-drawn copper wire selected as the respective specimen of sheet-and fiber-texture type. For theoretical analyses of these Texture types of cubic crystal material, two computer codes have been developed based on Bunge's formalism. Theoretical pole figures, inverse pole figures and orientation distribution function are calculated from three experimental pole figure inputs, and comparison of two results are discussed in detail to evaluate the analytical methods.

32815 **(KFTI—80-48) Physics of radiation damage and radiation material science.** (AN Ukrainskoj SSR, Kharkov. Fiziko-Tekhnicheskij Inst.). 1980. 114p. (In Russian). NTIS (US Sales Only), PC A06/MF A01. Order Number DE82780212.

Individual items from the report were prepared separately for the data base. (GHT)

32816 **(USC—113P19-77) Transport processes in slabs bounded by reflectors.** Poon, P.T.Y.; Ueno, S. (University of Southern California, Los Angeles (USA). Dept. of Electrical Engineering). Jan 1974. Contract AT03-76ER70019. 25p. NTIS, PC A02/MF A01. Order Number DE82005347.

Topics covered include: slabs bounded by reflectors; a hybrid of diffuse and specular reflectors; equation of transfer and boundary conditions; integral equation for the source function; isotropically scattering and inhomogeneous slab; reflected and transmitted intensities; Fredholm integral equation and the resolvent kernel; cauchy system for the scattering and transmission functions; numerical algorithm; and computational results. (GHT)

32817 **Radiations and their scattering by matter. Chapter 4.3. Neutrons.** Cowley, J.M. (Arizona State Univ., Tempe (USA). Dept. of Physics). pp 84-87 of Diffraction physics. Amsterdam, Netherlands; North-Holland (1981).

The neutrons of interest for diffraction experiments are the thermal neutrons which are in thermal equilibrium with the atoms in a nuclear reactor and so have an average energy of 0.025 eV, wavelength 1.5 A. However, the spread in a beam of neutrons from a reactor is broad. For diffraction experiments a narrow range of wavelengths is selected by using a crystal monochromator. Neutrons mainly interact with the nucleus. Results derived initially in the context of nuclear physics are quoted.

32818 **Diffraction from crystals. Chapter 6.5. Neutron diffraction structure analysis.** Cowley, J.M. (Arizona State Univ., Tempe (USA). Dept. of Physics). pp 132-134 of Diffraction physics. Amsterdam, Netherlands; North-Holland (1981).

The application of neutron diffraction to study hydrogen positions in organic and biologically significant crystals is considered. Magnetic materials are also considered.

32819 **Neutron scattering from spins and phonons in uranium compounds.** Buyers, W.J.L.; Holden, T.M.; Murray, A.F.; Jackman, J.A.; Norton, P.R. (Atomic Energy of Canada Ltd., Chalk River, Ontario. Chalk River Nuclear Labs.); DuPlessis, P. de V. (Rand Afrikaans Univ., Johannesburg (South Africa)); Vogt, O. (California Univ., Santa Barbara (USA). Inst. for Theoretical Physics). pp 187-192 of Valence fluctuations in solids. Proceedings of the Santa Barbara Institute of Theoretical Physics Conference, Santa Barbara, CA, USA, January 27-30, 1981. Falicov, L.M. (California Univ., Berkeley (USA)); Hanke, W. (Max-Planck-Institut fuer Festkoerperforschung, Stuttgart (Germany, F.R.)); Maple, M.B. (California Univ., San Diego, La Jolla (USA)) (eds.). Amsterdam, Netherlands; North-Holland (1981).

From Conference on valence fluctuations in solids; Santa Barbara, CA, USA (27 Jan 1981).

Recent single-crystal neutron experiments at Chalk River on the spin excitations in the rock salt structure compounds UN, US and UTe, have revealed the presence of a broad spectral response, instead of the sharp spin-wave peaks expected at low temperatures in magnetically-ordered crystals. The presence of broad features in chi(q,w) correlates with strong suppression of the ordered moment, with small ordering temperatures and with small lattice constants. It is suggested that the damping of the collective spin response in the UX series arises from intermediate valency. Evidence for this view is provided by the observation in photoemission of a narrow 5f-electron peak at the Fermi energy and by the fact that the actinide lattice constants are consistent with a valency change from 4+ to 3+ with increasing atomic number. By contrast, in UPd_3, where sharp spin excitations are observed, the 5f-electron peak lies below the Fermi energy.

32820 **Inelastic neutron scattering studies of single crystal TmSe.** Grier, B.H.; Shapiro, S.M. (Brookhaven National Lab., Upton, NY (USA)). pp 325-328 of Valence fluctuations in solids. Proceedings of the Santa Barbara Institute of Theoretical Physics Conference, Santa Barbara, CA, USA, January 27-30, 1981. Falicov, L.M. (California Univ., Berkeley (USA)); Hanke, W. (Max-Planck-Institut fuer Festkoerperforschung, Stuttgart (Germany, F.R.)); Maple, M.B. (California Univ., San Diego, La Jolla (USA)) (eds.). Amsterdam, Netherlands; North-Holland (1981).

From Conference on valence fluctuations in solids; Santa Barbara, CA, USA (27 Jan 1981).

Inelastic neutron scattering studies have been performed on a single crystal of stoichiometric (a = 5.71 A) TmSe. They confirm previous measurements performed on a polycrystalline sample which showed an inelastic line at 10 meV for T < approximately 40 K and another at 1 meV for T < Tsub(N) = 3.0 K. The energy of the 10 meV line exhibits weak dispersion across the Brillouin zone, while the intensity and linewidth show a stronger q dependence. The excitation is broader and less intense near the zone center than at the zone boundary. This feature results from the excitation of f-electrons across the hybridization gap formed when the localized f-electrons hybridize with the conduction band. The temperature and q dependences are consistent with a recent theoretical calculation of the neutron cross section for this case.

32821 **Dynamical susceptibility and neutron scattering cross section of a model mixed-valence system.** Fedro, A.J.; Sinha, S.K. (Argonne National Lab., IL (USA)). pp 329-332 of Valence fluctuations in solids. Proceedings of the Santa Barbara Institute of Theoretical Physics Conference, Santa Barbara, CA, USA, January 27-30, 1981. Falicov, L.M. (California Univ., Berkeley (USA)); Hanke, W. (Max-Planck-Institut fuer Festkoerperforschung, Stuttgart (Germany, F.R.)); Maple, M.B. (California Univ., San Diego, La Jolla (USA)) (eds.). Amsterdam, Netherlands; North-Holland (1981).

From Conference on valence fluctuations in solids; Santa Barbara, CA, USA (27 Jan 1981).

The authors have calculated the q and w-dependent spin and charge response functions as a function of temperature for an Anderson lattice. Operators are defined for the f electrons which restrict the occupancy to fsup(n) and fsup(n+1). The one-particle

Green's function results are similar to earlier approaches and the main effect of the on-site correlations on the two particle Green's function is to introduce kinematic restrictions on the f-site occupancies. These calculations account reasonably well for the behavior of the inelastic peak seen in neutron studies of Grier and Shapiro in TmSe. The charge response function is used to calculate the qualitative behavior of the phonon dispersion curves and results in interesting non-adiabatic behavior in the phonon spectrum.

6550 Medical Physics

32822 (INIS-SU—39) Problems on dosimetry and radiation protection. No. 19. Ivanov, V.I. (ed.). (Moskovskij Inzhenerno-Fizicheskij Inst. (USSR)). 1980. 135p. (In Russian). NTIS, PC A07/MF A01. Order Number DE82780229.

The papers presented were entered in the data base separately. (WHK)

32823 Calibration of phoswich detectors for assessment of plutonium in lungs: the methods of four laboratories compared. Campbell, G.W. (Lawrence Livermore National Lab., CA); Anderson, A.L.; Fry, F.A.; Newton, D.; Ramsden, D. *Health Physics;* **40**: 405-409(Mar 1981). Contract W-7405-ENG-48.

This paper presents the results of an intercomparison study of the calibration of phoswich detectors from 3 laboratories in the United Kingdom. Lung deposits of ^{239}Pu were assessed in the Lawrence Livermore Laboratory phantom thorax containing plutonium-loaded lungs. The equipment, measurement geometry and calibration methods employed by the laboratories are presented and discussed in terms of differences that these procedures might cause in the results. (KRM)

6560 Solid State Physics

REFER ALSO TO CITATION(S) 32754, 32812

32824 (AERE-PR/TP—37) Theoretical Physics Division progress report October 1979-September 1980. (UKAEA Atomic Energy Research Establishment, Harwell. Theoretical Physics Div.). Apr 1981. 136p. NTIS (US Sales Only), PC A07/MF A01. Order Number DE82700072.

Research at Harwell on nuclear, atomic and molecular physics, the theory of fluids, radiation damage, safety studies, point defects and point defect determined processes, surface studies and nondestructive examination are described.

32825 (CBPF-A—0010/80) Random magnetism. Tsallis, C. (Centro Brasileiro de Pesquisas Fisicas, Rio de Janeiro). Mar 1980. 19p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700084.

The 'ingredients' which control a phase transition in well defined system as well as in random ones (e.g. random magnetic systems) are listed and discussed within a somehow unifying perspective. Among these 'ingredients' we find the couplings and elements responsible for the cooperative phenomenon, the topological connectivity as well as possible topological incompatibilities, the influence of new degrees of freedom, the order parameter dimensionality, the ground state degeneracy and finally the 'quanticity' of the system. The general trends, though illustrated in magnetic systems, essentially hold for all phase transitions, and give a basis for connection of this area with Field theory, Theory of dynamical systems, etc.

32826 (CBPF-A—0013/80) Renormalization group treatment of bond percolation in anisotropic and 'inhomogeneous' planar lattices. de Magalhaes, A.C.N.; Tsallis, C.; Schwacheim, G. (Centro Brasileiro de Pesquisas Fisicas, Rio de Janeiro). Apr 1980. 34p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE82700085.

The uncorrelated bond percolation problem is studied in three planar systems where there are two distinct occupancy probabilities. Two different real space renormalization group approaches (referred as the 'canonical' (CRG) and the 'parametric' (PRG) ones) are applied to the anisotropic first-neighbour square lattice, and both of them exhibit the expected tendency towards the exactly known phase boundary ($p+q=1$). Then, within the context of PRG calculations for increasingly large cells, an extrapolation method is introduced, which leads to analytic proposals for the other two lattices, namely $p+q = 1/2$ for the first-and second-neighbour square lattice (p and q are, respectively, the first and second neighbour occupancy probabilities), and $3\ (p-1/2) = 4\ [(1-q)^3 + (1-q)^2]$ (p and q are, respectively, the occupancy probabilities of the topologically different bonds which are in a 1:2 ratio) for the 4- 8 lattice.

32827 (CBPF-A—0022/80) Electronic structure and Moessbauer hyperfine interactions of Au (I) compounds. Guenzburger, D.J.R.; Ellis, D.E. (Centro Brasileiro de Pesquisas Fisicas, Rio de Janeiro). Aug 1980. 38p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE82700087.

The electronic structure of the linear Au(I) complexes $[AuX_2]^{-1}$, where X=CN, Cl, and F has been studied in the self-consistent one-electron statistical exchange model. The relative importance of gold 5d, 6s, and 6p states in chemical bonding and for hyperfine interactions is examined, using an LCAO decomposition of the molecular eigenstates. The variation of the isomer shift and quadrupole splitting of ^{197}Au with covalency is studied theoretically. The effect of pressure on these hyperfine interactions for $K[Au(CN)_2]$ is investigated by considering different interatomic distances. In this latter case, the main discrepancies with respect to experiment found are believed to arise from bonding with exterior atoms. Relativistic effects are briefly explored by comparison of Dirac-Slater relativistic and non-relativistic results for the cyanide anion.

32828 (DOE/ER/01198—1372) Many-body effects on the x-ray spectra of metals. Satpathy, S.S. (Illinois Univ., Urbana (USA)). 1982. Contract AC02-76ER01198. 104p. NTIS, PC A06/MF A01. Order Number DE82006905.

Thesis.

The effects of band structure, of a solid surface, of temperature, and of disorder on the many-electron x-ray spectra of metals are evaluated in a change-of-mean-field approximation using a one-dimensional nearest-neighbor tight-binding model of a metal. The x-ray spectral shapes are determined by both the band structure and the final-state interactions. The effect of the band being non-free-electron-like is not felt at the x-ray threshold, but away from it such effects are noticeable. When the core hole is created at the surface, the spectra at the edge exhibit a Nozieres-de Dominicis-type singularity with the appropriate surface phase-shifts. At energies away from the edge, the one-particle effects are prominent with the x-ray emission and absorption spectra closely reflecting the local one-electron density of states. The recoil spectrum of a Fermi sea at a non-zero temperature has less asymmetry than the zero-temperature case. It was found that at ordinary temperatures the reduction of the asymmetry due to the thermal distribution of one-electron states is not very significant. Finally, using a one-dimensional Anderson model, the effect of lattice disorder on the x-ray absorption spectra is studied for the first time. There are two effects: (1) the strong infrared divergence peak is gradually quenched as disorder is increased, and (2) the threshold is broadened because the threshold energies for absorption at different sites in the crystal depend on the varying local lattice environment. It is proposed that the x-ray spectra may be useful as a tool for studying the degree of electron localization in disordered many-electron systems.

32829 (DOE/ER/10890—1) Interface hydrodynamic plasmon solutions of the Boltzmann equation. Antoniewicz, P.R.; Kleinman, L. (Texas Univ., Austin (USA). Dept. of Physics). 1978. Contract AS05-81ER10890. 12p. NTIS, PC A02/MF A01. Order Number DE82005631.

The hydrodynamic plasmon solutions of the Boltzmann equation for a bimetallic interface are studied. Standing waves are found in the low density metal which decay exponentially across the interface. The amplitude of the exponentially decaying charge density fluctuation is found to be resonant at a frequency which disperses upward from the interface plasmon frequency [(ω^2/sub

p+/ + ω²/sub p-/)/2]/sup 1/2/ with increasing transverse component of wave vector.

32830 (IA—1364, pp 6) **Universality of the bridge functions and a semi-empirical freezing criterion in 2 and 3 dimensions.** Rosenfeld, Y. Jul 1981. NTIS (US Sales Only), PC A13/MF A01.

In Research laboratories annual report 1980.

32831 (IA—1364, pp 6-7) **Alternative derivation of the free energy in the mean-spherical approximation.** Rosenfeld, Y. Jul 1981. NTIS (US Sales Only), PC A13/MF A01.

In Research laboratories annual report 1980.

32832 (IA—1364, pp 7) **Universal strong coupling equations of state.** Rosenfeld, Y. (Israel Atomic Energy Commission, Tel Aviv); Baram, A. (Weizmann Inst. of Science, Rehovoth (Israel)). Jul 1981. NTIS (US Sales Only), PC A13/MF A01.

In Research laboratories annual report 1980.

32833 (IAE—3308/9) **Orientation ordering (anti k=0) in interstitial solid solutions on the base of cubic (C-15) Laves phases.** Irodova, A.V. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Atomnoj Ehnergii). 1980. 24p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700093.

In the framework of a statistical thermodynamic theory of phase transformations the types are predicted of superstructures (AB_2X_3, AB_2X_4, AB_2X_4, AB_2X_3), which can be realized in interrstitial solid solutions on the base of cubic AB_2 Laves phases as a result of orientation ordering (K vector=0). It is shown on HfV_2D_4 that the type of a superstructure arising in a specific system is determined not only by the matrix symmetry and the type of located interstitials but also by the correlation range in the interstitial dislocation a disordered phase.

32834 (IFUSP-P—239) **Ising model with competing axial interactions in the presence of a field.** Yokoi, C.S.O.; Salinas, S.R.A.; Coutinho Filho, M.D. (Sao Paulo Univ. (Brazil). Inst. de Fisica). Sep 1980. 60p. NTIS (US Sales Only), PC A04/MF A01. Order Number DE82700094.

A layered Ising model is studied with competing interactions between nearest and next-nearest layers in the presence of a magnetic field. The analysis is carried out in the mean-field approximation with one effective field for each layer. The high-temperature region is studied analytically. The low-temperature region is studied numerically. T-H phase diagrams are constructed, which exhibit a variety of modulated phases, for various values of the ratio of the strength of the competing interactions. Numerical evidence of the devil's staircase behavior is found either as a function of temperature or applied magnetic field.

32835 (LA—9121-MS) **Vacancy behavior in a compressed fcc Lennard-Jones crystal.** Beeler, J.R. Jr. (Los Alamos National Lab., NM (USA)). Dec 1981. Contract W-7405-ENG-36. 79p. NTIS, PC A05/MF A01. Order Number DE82007054.

This computer experiment study concerns the determination of the stable vacancy configuration in a compressed fcc Lennard-Jones crystal and the migration of this defect in a compressed crystal. Isotropic and uniaxial compression stress conditions were studied. The isotropic and uniaxial compression magnitudes employed were $0.94 \leqq \text{eta} \leqq 1.5$, and $1.0 \leqq \text{eta} \leqq 1.5$, respectively. The site-centered vacancy (SCV) was the stable vacancy configuration whenever cubic symmetry was present. This includes all of the isotropic compression cases and the particular uniaxial compression case ($\text{eta} = \sqrt{2}$) that give a bcc structure. In addition, the SCV was the stable configuration for uniaxial compression $\text{eta} < 1.29$. The out-of-plane split vacancy (SV-OP) was the stable vacancy configuration for uniaxial compression $1.29 < \text{eta} \leqq 1.5$ and was the saddle-point configuration for SCV migration when the SCV was the stable form. For $\text{eta} > 1.20$, the SV-OP is an extended defect and, therefore, a saddle point for SV-OP migration could not be determined. The mechanism for the transformation from the SCV to the SV-OP as the stable form at $\text{eta} = 1.29$ appears to be an alternating sign [101] and/or [011] shear process.

32836 (LA-UR—81-3590) **Polarons in polyacetylene.** Bishop, A.R.; Campbell, D.K. (Los Alamos National Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 15p. (CONF-810385—5). NTIS, PC A02/MF A01. Order Number DE82006106.

From Conference on non-linear problems: present and future; Los Alamos, NM, USA (Mar 1981).

Recent theoretical studies of polyacetylene, (CH)/sub x/ have focused on kink-like solutions in the trans isomer. It is shown that the same theoretical models also predict polaron-like solutions in both cis- and trans-(CH)/sub x/. The explicit form of these polarons, their relation to kinks, possible implications for experiment, and open questions are discussed.

32837 (PUC-tn—05/80) **Percolation with first-and-second neighbour bonds: a renormalization-group calculation of critical exponents.** Riera, R.; de Oliveira, P.M.C.; Chaves, C.M.G.F.; de Queiroz, S.L.A. (Pontificia Univ. Catolica do Rio de Janeiro (Brazil). Inst. de Fisica). Apr 1980. 20p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700100.

A real-space renormalization group approach for the bond percolation problem in a square lattice with first- and second-neighbour bonds is proposed. The respective probabilities are treated, as independent variables. Two types of cells are constructed. In one of them the lattice is considered as two interpenetrating sublattices, first-neighbour bonds playing the role of intersublattice links. This allows the calculation of both critical exponents ν and γ, without resorting to any external field. Values found for the critical indices are in good agreement with data available in the literature. The phase diagram in parameter space is also obtained in each case.

32838 (PUC-tn—17/80) **Transfer matrix treatment for linear chains with long range interactions.** Koiller, B.; Brandi, H.S. (Pontificia Univ. Catolica do Rio de Janeiro (Brazil). Inst. de Fisica). Aug 1980. 15p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700102.

The transfer matrix technique is extended to determine the Green's function for 1-d systems with long range interactions. The formalism is applied to study the density of states and impurity modes of linear chains; calculations are presented for nearest and next nearest neighbors interactions.

32839 (PUC-tn—18/79) **Remarks on the percolation problem in anisotropic systems.** Chaves, C.M.G.F.; de Oliveira, P.M.C.; de Queiroz, S.L.A.; Riera, R. (Pontificia Univ. Catolica do Rio de Janeiro (Brazil). Inst. de Fisica). Jul 1979. 14p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE81700928.

The bond percolation problem is discused in an anisotropic square lattice using the position space renormalization group. It is shown that, due to symmetry, this treatment reproduces known exact results for this problem. The phase diagram and the flow lines in parameter space are also shown. Results are in agreement with universality.

32840 **Neutron critical scattering in PAA.** Rajewska, A.; Jablonka, A.; Sikorska, D.; Sobaszek, A. (Politechnika Warszawska (Poland). Inst. Fizyki). pp 109-110 of Advances in liquid crystal research and applications. Bata, J. (eds.). Budapest, Hungary; Akademiai Kiado (1981).

From 3. liquid crystal conference of the socialist countries; Budapest, Hungary (27 Aug 1979).

Neutron critical scattering experiments were performed on PAA. The experiments were made between the melting point and the clearing point for very small values of scattering vector (0.02-0.05) A^{-1}, using neutrons of 1.53 A wavelength.

32841 Structure and dynamics of d-PAA neutron scattering. Pepy, G. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France)); Kroo, N.; Rosta, L. (Hungarian Academy of Sciences, Budapest. Central Research Inst. for Physics). pp 111-122 of Advances in liquid crystal research and applications. Bata, J. (eds.). Budapest, Hungary; Akademiai Kiado (1981).

From 3. liquid crystal conference of the socialist countries; Budapest, Hungary (27 Aug 1979).

Elastic and inelastic neutron scattering experiments were performed on d-PAA parallily at the Saclay and Budapest Reactors. Diffraction studies resulted in patterns showing fine structure of the first elastic peak in the nematic phase. Temperature and magnetic field dependence of this peak and its correlation with the macroscopic relaxation were investigated. Resonances observed by coherent inelastic scattering scans prove the existence of collective excitations in the nematic phase.

32842 Moessbauer spectroscopy of thermotropic smectic liquid crystals: on the formation of complexes between label and liquid crystal molecules. Rochev, V.Ya.; Keodin, O.P. (AN SSSR, Moscow. Inst. Khimicheskoj Fiziki); Parak, F. (Technische Univ. Muenchen (Germany, F.R.)). pp 363-370 of Advances in liquid crystal research and applications. Bata, J. (eds.). Budapest, Hungary; Akademiai Kiado (1981).

From 3. liquid crystal conference of the socialist countries; Budapest, Hungary (27 Aug 1979).

Liquid crystal (LC) compound ethyl-p-anisalaminocinnamate (EAAC), having smectic-A as well as monotropic smectic-B phases, has been investigated by Moessbauer spectroscopy using ferrocene (F) enriched by ^{57}Fe isotope as a label.

32843 Lyotropic mesophases studied by ^{31}P-NMR. Klose, G.; Arnold, K.; Gawrisch, K.; Volke, F. (Karl-Marx-Universitaet, Leipzig (German Democratic Republic). Sektion Physik). pp 787-798 of Advances in liquid crystal research and applications. Bata, J. (eds.). Budapest, Hungary; Akademiai Kiado (1981).

From 3. liquid crystal conference of the socialist countries; Budapest, Hungary (27 Aug 1979).

The ^{31}P-NMR is a powerful method to study liquid crystalline systems. Information about the phase states is obtained by only "a look" if the screening tensor of the anisotropy of chemical shift is known. The line shapes indicate also very simply mixed and transition states. If the screening tensor is known detailed information about dynamical and conformation states can be obtained. Finally the ^{31}P-NMR can give valuable insight into very complex systems as biological systems. Liquid crystalline mesophases and their properties (structure, dynamical processes) are studied by different physical methods as X-ray-, neutron- and light-scattering, NMR etc. Each method is based on special parameters which are sensitive to certain properties. Each method yields therefore only information about these properties. If the molecules forming liquid-crystalline mesophases contain ^{31}P-atoms the ^{31}P-NMR can be used as a powerful physical technique.

6561 Superconductivity

REFER ALSO TO CITATION(S) 32149

32844 (BMFT-FB-T—81-009) Nb-Ti base high-field superconductors with current capacities in excess of 3000 A for application in magnet systems with alternating field components. Best, K.J.; Hillmann, H.; Hoeflich, H.; Rudolph, J.; Pfeiffer, I.; Weber, H. (Bundesministerium fuer Forschung und Technologie, Bonn (Germany, F.R.)). Jan 1981. 206p. (In German). NTIS (US Sales Only), PC A10/MF A01. Order Number DE82780287.

Monolithical and fully transposed conductors with current capacities of up to 1000 A at 5 T and 4.2 K as well as measurement methods are described. For conductor technology, extrusion as well as bundling and sealing methods have been developed and tested, a number of different conductors with different substrate amounts and combinations with high-resistivity substrate have been produced and optimized. Fully transposed conductors have been developed as flat cables. A process for continuous soldering and an equipment for soldering cables have been developed and set up.

6570 Theoretical Physics

32845 (CONF-810842—3) Tests of a simple multinomial hypothesis when the sample is not large. Atwood, C.L. (EG and G Idaho, Inc., Idaho Falls (USA)). 1981. Contract AC07-76ID01570. 15p. NTIS, PC A02/MF A01. Order Number DE82005955.

From American Statistical Association meeting; Detroit, MI, USA (10 Aug 1981).

Outlying cells can be identified, based on the binomial distribution; the Bonferroni inequality then gives a conservative overall test. If instead, the Pearson chi-squared statistic is used, its distribution can be approximated as follows: condition on the counts in the first several cells, and approximate the conditional distribution as a shifted gamma distribution, matching the first two moments. Combine these approximate conditional distributions to obtain an approximate unconditional distribution. Generalized Chebyshev inequalities give bounds on the accuracy of the approximation; the fineness of the decomposition can be adjusted during the calculations to guarantee any desired accuracy. In examples, a good approximation is achieved by conditioning on those cells with the smallest probabilities.

32846 (RL—81-054) Three dimensional field computation. Trowbridge, C.W. (Science Research Council, Chilton (UK). Rutherford and Appleton Labs.). Jun 1981. 6p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700357.

Recent research work carried out at Rutherford and Appleton Laboratories into the Computation of Electromagnetic Fields is summarised. The topics covered include algorithms for integral and differential methods for the solution of 3D magnetostatic fields, comparison of results with experiment and an investigation into the strengths and weaknesses of both methods for an analytic problem. The paper concludes with a brief summary of the work in progress on the solution of 3D eddy currents using differential finite elements.

32847 (SAND—81-1729C) Axisymmetric solutions in elastostatics and elastic wave propagation by ascent methods. Norwood, F.R. (Sandia National Labs., Albuquerque, NM (USA)). 1981. Contract AC04-76DP00789. 3p. (CONF-8106189—1). NTIS, PC A02/MF A01. Order Number DE82006283.

From 9. US national congress of applied mechanics; Ithaca, NY, USA (21 Jun 1981).

In the present work a method of ascent for axisymmetric problems is developed. It is shown that, for problems where the vector or scalar Laplacian operator specifies the space behavior of the potential functions, the three-dimensional axisymmetric problems may be solved by operating on the solution to an associated two-dimensional problem. Hence, the theoretical results presented here may be applied to heat transfer problems, to problems in elastostatics and to elastic wave propagation problems.

70 FUSION ENERGY

7001 Plasma Research

32848 (DOE/ET/51013—27) Comparative study of fundamental and second-harmonic ICRF wave propagation and damping at high density in the Alcator tokamak. Gaudreau, M.P.J. (Massachusetts Inst. of Tech., Cambridge (USA). Plasma Fusion Center). Sep 1981. Contract AC02-78ET51013. 409p. (PFC/RR—81-31). NTIS, PC A18/MF A01. Order Number DE82004871.

Due to the versatility of the high power apparatus, the fast magnetosonic branch is used with ω_0 = 1,2,3,4 ω/sub ci/, unlike most other ICRF experiments. Unusually high magnetic field (B_0 = 40 to 80 kG), plasma density (n/sub e/ = 10^{13} - 5 x 10^{14}/cm^3), gen-

erator frequency (f_0 = 90 to 200 MHz) and transmitter power, with shielded and unshielded antennas, are the key parameters of the experiment. This wide parameter range allows a direct comparison between fundamental and second harmonic regimes, and shielded and unshielded antennas, our prime goals. The real and imaginary parts of the parallel and perpendicular wave numbers are measured with extensive magnetic probe diagnostics for a spectrum of plasma parameters and compared with theory. Qualitative and quantitative evaluations of the wave structure and scaling laws are derived analytically in simple geometries and computed numerically for realistic plasma parameters and profiles. General figures of merit, such as radiation resistance and quality factor, are also derived and compared with the experiment. Secondary effects of the high power wave launching, such as changes in plasma current, density, Z/sub eff/, energetic neutral flux, soft x-rays, neutron flux, and impurities are also discussed. Most important, a general synthesis of the many engineering, physics, and experimental problems and conclusions of the Alcator A ICRF program are inspected in detail. Finally, the derived and experimentally determined scaling laws and engineering constraints are used to estimate the ICRF requirements, advantages, and potential pitfalls of the next generations of experiments on the Alcator tokamaks.

32849 **(EFI—442(49)-80) Soliton excitation in a nonisothermal electron-ion plasma by electron bunch with given parameters.** Amatuni, A.T.; Sekhposyan, E.V.; Ehlbakyan, S.S. (Erevanskij Fizicheskij Inst. (USSR)). 1980. 14p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700103.

The problem on the excitation of the stationary solitary waves (solitons) in the electron-ion nonisothermal collisionless plasma by the given external electron bunch is precisely solved. It is shown that solitons in such plasma may become excited by the electron bunch only provided the definite values of electron velocity and density, with only one of these parameters being free.

32850 (IA—1364, pp 82) **Generation of UV radiation utilizing the copper vapor laser lines.** Lotem, H.; Tenenbaum, J. Jul 1981. NTIS (US Sales Only), PC A13/MF A01.

In Research laboratories annual report 1980.

32851 (IA—1364, pp 83) **Self-calibrating technique for beam divergence measurements of CW and pulsed lasers.** Lavi, S.; Gabay, S.; Miron, E.; Erez, G. Jul 1981. NTIS (US Sales Only), PC A13/MF A01.

In Research laboratories annual report 1980.

32852 **(IAE—3268/7) Stabilization of a vertical instability by a feedback system at the T-12 installation.** Gerasimov, S.N.; Naftulin, S.M. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Atomnoj Ehnergii). 1980. 18p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700104.

At the T-12 ring tokamak with a poloidal divertor the effect of stabilization of instability in relation to a vertical plasma filament shift as a whole is obtained using a feedback system (FS). A thyristor power amplifier is used in the system. Controlling is performed b.v time-pulse modulation. Depending on the power supply voltage the power amplifier permits to obtain control currents up to 5000 A. The current pulse duration can be varied in the 0.3-1.5 ms range. Stabilization is carried out due to keeping plasma filament in the stability range by controlling plasma filament location in relation to the equatorial plane. The stabilization effect of a vertical instability both in a programming regime and in an automatic controlling regime using a feedback system is obtained.

32853 **(IAE—3309/6) Classical transfer coefficients in a plasma with impurities.** Tyrkova, I.A.; Yushmanov, P.N. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Atomnoj Ehnergii). 1980. 29p. (In Russian). NTIS (US Sales Only), PC A03/MF A01. Order Number DE82700105.

The review of calculations of transfer coefficients in a multicomponent totally ionized plasma with arbitrary charges and mass is given. The summary of results is supplemented with viscosity coefficients calculation in a complex composition plasma. When calculating transfer coefficients for light components - electrons and protons - the difference of cross section of collision of light particles with heavy ones from the Coulomb cross section is taken into account. This effect arises due to superthermal particles flight through electron shells of incompletely ionized ions and may be presented as ion charge increase with the growth of energy of the incident particle. If the heavy ion charge is twice or more times less than the nucleus charge, then the transfer coefficients in a plasma with such ions may twice three times differ from the Coulomb ones. The influence of the described effect on the number of runaway electrons is also considered.

32854 **(IAE—3321/8) Transport processes in a tokamak with adiabatic compression. Mathematical model and first-stage calculating results.** Vikhrev, V.V.; Pogutse, O.P.; Chudin, N.V.; Yurchenko, E.I. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Atomnoj Ehnergii). 1980. 33p. (In Russian). NTIS (US Sales Only), PC A03/MF A01. Order Number DE82700106.

A mathematical model which can be used for ionization calculations, transport processes, compression and heating in a tokamak with adiabatic compression is described. Initial notation for obtaining model equations is the divergent one (in the form of conservation laws) of the total transport equation notation. It allows physically by visual demonstration to describe the plasma compression effects over a small and large torr radii. The results of numerical simulation of the initial discharge stage (prior to compression) are given. The effect of mixing, neutral atom diffusion as well as different values of electron and ion heat conduction coefficients on discharge parameters is studied in detail. The variant of initial discharge stage development, which serves as a base for compression study is chosen. Main calculation results are as follows. The proposed model appears to be quite insensitive to specific type of processes for which at present there are not sufficiently reliable experimental results (mixing, dependence of chisub(e) on the radius). The determining arc losses along the electron channel. Cross section average electron and iron temperatures for the time moment 100 ms are in the 250 eV<anti T sub(e)<300 eV, 200 eV<anti Tsub(i)<250 eV range. About 30% of magneti flux are spent for cmic plasma heating, the rest goes for inductive energy increase.

32855 **(IAE—3324/7) Efficiency of plasma electron cyclotron-resonance heating in the TM-3 tokamak.** Poznyak, V.I. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Atomnoj Ehnergii). 1980. 34p. (In Russian). NTIS (US Sales Only), PC A03/MF A01. Order Number DE82700107.

Possible mechanisms of SHF waves absorption in a small tokamak near by harmonics of the electron cyclotron resonance (ECR) are discussed. The model of wave behaviour near by the ECR second harmonic in a small tokamak is considered. The qualitative correspondence to experimental data allows to conclude that at the plasma concentration increase due to wave refraction the ohmic absorption by chamber walls of of SHF power starts to surpose plasma absorption and becomes a determining one. Experimental characteristics of wave absorption near by the first ECR harmonic are obtained. Ordinary and extraordinary wave absorption concentration regions are pointed out. The absorption dependence on intraduced input power is presented.

32856 **(IPP—6-201) Theory of the M = 1 mode in high temperature plasmas.** Biskamp, D.; Welter, H. (Max-Planck-Institut fuer Plasmaphysik, Garching (Germany, F.R.)). Sep 1980. 24p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82780289.

The linear and nonlinear properties of the m = 1 kink mode have been investigated numerically and analytically within two fluid theory taking into account diamagnetic drifts, ion viscosity μ and plasma diffusion kappa in addition to resistivity eta. In the regime of strong diamagnetic effects, $\omega_{sub}(*)/\gamma_{sub}(T) > 1$, the linear growth rate is a very sensitive function of kappa, being strongly reduced and even negative around kappa approx. > eta. Nonlinearly the mode is found to saturate at finite amplitude in

contrast to the resistive regime ωsub(*)/γsub(T) < 1, where complete reconnection occurs. The main stabilizing effect is a nonlinear azimuthal flow near the resonant radius; hence there is a strong dependence on μ. A quasi-linear theory can explain the main numerical results. Brief application to tokamak experiments is given.

32857 (IPPJ—438) Proceedings of USSR-Japan joint seminar on plasma diagnostics Nov. 13, 1979 through Nov. 17, 1979. (Nagoya Univ. (Japan). Inst. of Plasma Physics). 10 Jan 1980. 228p. (CONF-7911169—). NTIS (US Sales Only), PC A11/MF A01. Order Number DE82780213.

From USSR-Japan joint seminar on plasma diagnostics; Nagoya, Japan (13 Nov 1979).

Abstracts for each paper were entered into the data base. (MOW)

32858 (IPPJ—474) Tearing modes in a current sheet with weak normal magnetic field. Nishikawa, K.; Sakai, J. (Nagoya Univ. (Japan). Inst. of Plasma Physics). Aug 1980. 21p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700112.

A set of coupled eigenmode equations in a current sheet with the weak normal magnetic field is solved numerically. We found that, due to the effect of normal magnetic field, a series of vortexes appears in the magnetic island. This new tearing mode can grow much faster than the usual tearing mode.

32859 (IPPJ—475) Oblique collision of plane ion-acoustic solitons. Nishida, Y.; Nagasawa, T. (Nagoya Univ. (Japan). Inst. of Plasma Physics). Sep 1980. 12p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700113.

Nonlinear evolutions of oblique collision are investigated experimentally on the plane ion-acoustic solitons in two-dimensional space. The observed many of the characteristics of inelastic collision of solitons are found to be similar to those of resonance interactions described by nonlinear ion acoustic waves.

32860 (IPPJ—476) Mechanism for ion heating by lower hybrid waves. Abe, H. (Nagoya Univ. (Japan). Inst. of Plasma Physics). Sep 1980. 13p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700114.

The heating mechanism of ions due to lower hybrid waves is studied computationally. In the usual lower hybrid wave heating of tokamaks, almost all the wave energy transferred to ions is consumed in producing the high-energy tail. This occurs even in the presence of the moderate parametric instability. In most cases, therefore, the main heating mechanism must be reduced to collisional relaxations from the high-energy tail of ion to the bulk.

32861 (IPPJ—477) Simulation of plasma confinement in RF plugged cusp field. Ohsawa, Y.; Kamimura, T. (Nagoya Univ. (Japan). Inst. of Plasma Physics). Sep 1980. 34p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE82700115.

Conditions for effective radio-frequency plugging of a cusp plasma are examined with a Monte Carlo simulation model. Both adiabatic and nonadiabatic plugging are studied. The dependence of the plugging efficiency on the machine system size, the applied frequency, and the amplitude of the rf field is clearly shown, and optimum conditions for plugging are found.

32862 (IPPJ—478) Spinning plasma ring stable to tilting mode. Mohri, A. (Nagoya Univ. (Japan). Inst. of Plasma Physics). Sep 1980. 7p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700116.

The tilting instability of a current-carrying plasma ring bedded in an external magnetic field for equilibrium can be stabilized by spinning the ring about its major axis at the angular velocity above a critical value. This value is estimated using a rigid rotor model.

32863 (IPPJ—480) Two dimensional behavior of solitons in a low-β plasma with convective motion. Makino, M.; Kamimura, T.; Sato, T. (Nagoya Univ. (Japan). Inst. of Plasma Physics). Sep 1980. 24p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700117.

The initial value problem of the Hasegawa-Mima (HM) equation, which describes the propagation of drift waves in a low beta magnetized plasma, is numerically studied. Solitons are formed from an initial sinusoidal wave. For a wide range of initial conditions, the number of solitons and the recurrence time agree well with those obtained from the KdV eq. reduced from the HM eq. by Nozaki et al. As a result of nonlinear interactions among different solitons, their peak positions shift in the direction normal to the zeroth order convective motion in a regular but different fashion. When we start from a sinusoidal wave, the peaks of the generated soliton train line up on a line at an angle with respect to the convective direction. Two-dimensional collisions of different solitons are examined.

32864 (IPPJ—481) Mixing length hypothesis in the dissipative trapped ion instability. Hatayama, A.; Koshi, Y.; Ogasawara, M. (Nagoya Univ. (Japan). Inst. of Plasma Physics). Oct 1980. 10p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700118.

The mixing length hypothesis is investigated for the purpose of making the underlying idea of the hypothesis clear in the case of the dissipative trapped ion instability. Three different approaches are employed; 1) analogy to the ordinary turbulence in hydrodynamics, 2) a nonlinear turbulent collision theory, and 3) a quasilinear theory of the density flattening. If the isotropic turbulence is assumed, the mixing length hypothesis can be derived by the first two approaches. The formula D asymptotically equals γ/k sub(perpendicular)sup(2), which is usually obtained from the mixing length hypothesis, can be derived by the third approach.

32865 (IPPJ—483) Numerical simulation of density evolution in JIPP T-2 tokamak. Shimizu, K.; Okamoto, M.; Amano, T. (Nagoya Univ. (Japan). Inst. of Plasma Physics). Oct 1980. 29p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE82700119.

The density evolution in JIPP T-2 tokamak during gas injection is numerically analyzed using a one dimensional tokamak transport code. The numerical model contains the neoclassical transport including the trapped particle pinch effect (the Ware pinch), empirical anomalous particle and electron heat transports based on ALCATOR scaling, neutral particle transport and Oxygen impurity transport. The Ware pinch effect is significant for the central density rise. The inversion of density profile in the inner region during gas puffing can not be explained. However, the rate of the central density rise observed in the experiment is well explained by the simulation if the energy of recycling neutrals is several tens eV. The effects of ion temperature gradient drift instability on the density evolution are also investigated.

32866 (IPPJ—484) New series of integrable nonlinear evolution equations. Ichikawa, Y.H.; Wadati, M.; Konno, K.; Shimizu, T. (Nagoya Univ. (Japan). Inst. of Plasma Physics). Oct 1980. 27p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE82700120.

Recent results of our research are surveyed in this report. The derivative nonlinear Schroedinger equation for the circular polarized Alfven wave admits the spiky soliton solutions for the plane wave boundary condition. The nonlinear equation for complex amplitude associated with the carrier wave is shown to be a generalized nonlinear Schroedinger equation, having the ordinary cubic nonlinear term and the derivative of cubic nonlinear term. A generalized scheme of the inverse scattering transformation has confirmed that superposition of the A-K-N-S scheme and the K-N scheme for the component equations valids for the generalized nonlinear Schroedinger equation. Then, two types of new integrable nonlinear evolution equation have been derived from our scheme of the inverse scattering transformation. One is the type of nonlinear Schroedinger equation, while the other is the type of Korteweg-de Vries equation. Brief discussions are presented for physical phenomena, which could be accounted by the second type of the new

integrable nonlinear evolution equation. Lastly, the stationary solitary wave solutions have been constructed for the integrable nonlinear evolution equation of the second type. These solutions have peculiar structure that they are singular and discrete. It is a new challenge to construct singular potentials by the inverse scattering transformation.

32867 **(IPPJ—485) Relation between Weibel instability and magnetic field generating thermal instability.** Ogasawara, M.; Hirao, A. (Nagoya Univ. (Japan). Inst. of Plasma Physics). Nov 1980. 18p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700121.

Comparison of the mechanisms of the Weibel instability and the field generating thermal instability is made on the basis of the Boltzmann equation. The case k perpendicular nabla T_0//nabla n_0 is investigated, where k is the wavevector, T_0 and n_0 are the zeroth order temperature and the number density. In the collisional plasma (kl sub(m) << 1, where l sub(m) is the electron mean free path), the thermal instability arises, but the Weibel instability does not. In the collisionless case (kl sub(m) >> 1), the situation is vice versa. When the equilibrium velocity distribution function is expanded by the Legendre polynomials P sub(l) with the polar axis along nabla T_0 and nabla n_0, l = 2 and l = 1 components are essential, respectively, for the Weibel instability and the thermal instability.

32868 **(IPPJ—486) Numerical study of explosive tearing mode instability in one-component plasmas.** Terasawa, T. (Nagoya Univ. (Japan). Inst. of Plasma Physics). Nov 1980. 49p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE82700122.

A numerical simulation is performed to investigate the nonlinear phase of the collisionless tearing mode instability. The results are found consistent with the prediction by the theory by Galeev, Coroniti, and Ashour-Abdalla, who predicted the existence of an explosive phase of the instability caused by the magnetization of particles by the perturbed component of the magnetic field normal to the neutral sheet. Although electrostatic effects on the evolution of the instability is neglected a priori in the present numerical simulation, there seems to be a good possibility of the explosive evolution of the tearing mode instability in its nonlinear stage. It is further noted that the particles are heated adiabatically within the magnetic islands by the one-dimentional compression process.

32869 **(IPPJ—487) Computer simulation on microinstabilities and anomalous resistivity near the magnetic neutral sheet.** Tanaka, M.; Sato, T.; Kamimura, T. (Nagoya Univ. (Japan). Inst. of Plasma Physics). Nov 1980. 48p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE82700123.

An investigation on microinstabilities in a field-reversed plasma is performed by using a 2-D magnetostatic particle code. The reversed magnetic field is maintained by both the electron and ion diamagnetic currents, and the ion temperature is assumed to be higher than the electron temperature with a view of applying to the magnetosphere. It is observed that a flute instability occurs in local regions with steep density gradient off the neutral sheet; its frequency is approximately the lower-hybrid frequency and the wavelength is near the electron Larmor radius. The observed dispersion relation suggests that the instability must be the lower-hybrid-drift instability (LHDI). The initial laminar diamagnetic current is rapidly disturbed to form E x B electron vortices, with simultaneous electron and ion acceleration in the neutral sheet. On the neutral line where the plasma Beta is extremely large, an unstable electromagnetic mode is observed to develop after the LHDI saturates; accordingly, the magnetic neutral line is deformed into a meandering structure. Anomalous resistivity and anomalous plasma transport are observed associated with the development of the LHDI; even on the neutral line there exists a small but finite resistivity which is attributed to the unstable magnetic mode. It is found that the resistivity eta increases as eta proportional(V sub(di)/v sub(thi))sup(1.9), where V sub(di) is the diamagnetic drift speed of ions and v sub(thi) is the ion thermal speed; the resistivity increases as T sub(i)/T sub(e) (>1) increases. Significant heating is also observed around the neutral line, which can be ascribed to the energy conversion from the magnetic field energy via the induced electric field.

32870 **(IPPJ-DT—82) Feedback controller of ultra high pressure gas.** Fujiwaka, S. (Nagoya Univ. (Japan). Inst. of Plasma Physics). Oct 1980. 11p. (In Japanese). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700124.

This controller was designed and manufactured for the purpose of experiments that Ultra high pressure gas was used. And it was desinged to put into practice experiment of pressure range up to 2500 kg/cm^2 G and the gas volume 200 CC. The control system needs satisfying relation of $p_1.a_1 < p_2.a_2$, and $E_1 = E_2$. And p_1, p_2 are either pressure in the gas and liquid cylinder, and a_1, a_2 are the piston cross section in the gas and liquid cylinder, respectively. E_1 and E_2 are output voltage of the pressure gauge and the piston setter, respectively.

32871 **(ITP—80-108-E) Influence of the collisions of electrons and ions with atoms and molecules on the dynamic form-factors of bounded many-particle systems.** Yakimenko, I.P.; Zagorodny, A.G. (AN Ukrainskoj SSR, Kiev. Inst. Teoreticheskoj Fiziki). 1980. 39p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE82700126.

The kinetic theory of fluctuations is used to investigate the influence of the collisions of charged particles with atoms and molecules on the dynamic form-factors of semi-infinite weakly ionized plasma. It is shown that the collisions between the electrons and neutral particles and the diffuse processes connected with them lead to a much increased influence of the boundary on correlations in a plasma.

32872 **(JAERI-M—9167) One-dimensional transport code for the simulation of D-T burning tokamak plasma. POISE 1.** Tone, T.; Maki, K.; Kasai, M.; Nishida, H. (Japan Atomic Energy Research Inst., Tokyo). Nov 1980. 122p. (In Japanese). NTIS (US Sales Only), PC A06/MF A01. Order Number DE82700470.

A one-dimensional transport code for D-T burning tokamak plasma has been developed, which simulates the spatial behavior of fuel ions(D, T), alpha particles, impurities, temperatures of ions and electrons, plasma current, neutrals, heating of alpha and injected beam particles. The basic transport equations are represented by one generalized equation so that the improvement of models and the addition of new equations may be easily made. A model of burn control using a variable toroidal field ripple is employed. This report describes in detail the simulation model, numerical method and the usage of the code. Some typical examples to which the code has been applied are presented.

32873 **(JAERI-M—9354) Computational studies of tokamak plasmas.** Takizuka, T.; Tsunematsu, T.; Tokuda, S. (Japan Atomic Energy Research Inst., Tokyo). Feb 1981. 80p. NTIS (US Sales Only), PC A05/MF A01. Order Number DE82700129.

Computational studies of tokamak plasmas are extensively advanced. Many computational codes have been developed by using several kinds of models, i.e., the finite element formulation of MHD equations, the time dependent multidimensional fluid model, and the particle model with the Monte-Carlo method. These codes are applied to the analyses of the equilibrium of an axisymmetric toroidal plasma (SELENE), the time evolution of the high-beta tokamak plasma (APOLLO), the low-n MHD stability (ERATO-J) and high-n ballooning mode stability (BOREAS) in the INTOR tokamak, the nonlinear MHD stability, such as the positional instability (AEOLUS-P), resistive internal mode (AEOLUS-I) etc., and the divertor functions.

32874 **(KFTI—80-37) General and nuclear physics.** (AN Ukrainskoj SSR, Kharkov. Fiziko-Tekhnicheskij Inst.). 1980. vp. (In Russian). NTIS (US Sales Only), PC A06/MF A01. Order Number DE82780214.

Separate abstracts for each paper were entered into the data base. (MOW)

32875 (ORNL/TM—8063) Finite-beta effects on the nonlinear evolution of the (m = 1;n = 1) mode in tokamaks. Holmes, J.A.; Carreras, B.A.; Hicks, H.R.; Lynch, V.E.; Rothe, K.E. (Oak Ridge National Lab., TN (USA)). Jan 1982. Contract W-7405-ENG-26. 54p. NTIS, PC A04/MF A01. Order Number DE82007124.

The stability and evolution of ISX-B-like plasmas are numerically studied using a reduced set of resistive magnetohydrodynamic (MHD) equations. For a sequence of equilibria stable to ideal modes, the n = 1 mode changes from a tearing branch to a pressure-driven branch as β/sup p/ is increased. When this mode is unstable at low beta, it is just the (m = 1;n = 1) tearing mode. Higher n modes also become linearly unstable with increasing β/sub p/; they are essentially pressure driven and have a ballooning character. For low values of beta the instability is best described as a β/sub p/ distortion of the (m = 1;n = 1) tearing mode. This mode drives many other helicities through toroidal and nonlinear couplings. As β/sub p/ is increased, the growth of the m = 1 island slows down in time, going from exponential to linear before reconnection occurs. If β/sub p/ is large enough, the island saturates without reconnection. A broad spectrum of other modes, driven by the (m = 1;n = 1) instability, is produced. These results agree with some observed features of MHD activity in ISX-B.

32876 (PLF—39) Experimental investigation of linear mode conversion in laser-produced plasmas. Maaswinkel, A.G.M. (Max-Planck-Gesellschaft zur Foerderung der Wissenschaften e.V., Garching (Germany, F.R.). Projektgruppe fuer Laserforschung). Dec 1980. 111p. NTIS (US Sales Only), PC A06/MF A01. Order Number DE82780288.

In this work absorption mechanisms are investigated in hot dense plasmas produced by intense laser irradiation of planar targets. Central in this investigation stands the absorption by linear mode conversion; this process occurs in inhomogeneous plasmas if the electric field vector of the incident EM-wave has a component parallel to the density gradient; this causes electrostatic oscillations at the critical density (where ωsub(p)sub(e) = ω). In addition, absorption of the laser light by inverse bremsstrahlung is investigated. The absorption is determined by the reflection of the laser light from the plasma. To this aim optical diagnostics are used. The reflection into 4π sr is measured with an Ulbricht sphere, also the reflection in specular (geometric) direction is recorded. The absorption mechanisms have been isolated by variation of the polarization of the beam and the angle of incidence to the target. An essential part of the work has been the frequency up-conversion of the laser beam by nonlinear crystals; in this way the wavelength-dependence of the absorption in the plasma has been investigated at wavelengths 1.06 μm, 0.53 μm and 0.26 μm; the pulse duration in the experiments was 30 ps, the maximum irradiation on target was 10^{14} W/cm^2.

32877 (SAI—254-81-387-LJ) Stability of low-frequency modes in tandem mirrors and bumpy tori. Tsang, K.T.; Catto, P.J. (Science Applications, Inc., Boulder, CO (USA). Plasma Research Inst.). Nov 1981. Contract AC03-76ET53057. 31p. (PRI—34). NTIS, PC A03/MF A01. Order Number DE82006016.

The system of equations appropriate for describing low frequency modes (Ω < Ω/sub i/) in general geometry for a three-species plasma is derived. The derivation employs an eikonal ansatz and for simplicity assumes Maxwellian unperturbed distribution functions, but permits arbitrary beta and asymmetry. The full system of equations includes ballooning, interchange and compressional Alfven modes, and drift waves. As an example of the general forms, the stability of electron rings in bumpy tori and/or tandem mirrors is considered. Some simple estimates of the conditions necessary for stable operation are presented.

32878 (SFTI—10) Effect of metallic diaphragms on discharge evolution in a zet-pinch. Kvartskhava, I.F.; Gvaladze, Yu.S.; Butov, I.Ya. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Sukhumi. Fiziko-Tekhnicheskij Inst.). 1980. 19p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700134.

Self-constricted high-current discharges of a zet pinch type are characterized with repeated breakdowns in the near-wall region of a discharge chamber. Two approaches to the repeated breakdown problem are possible: their elimination on usage for improving plasma heating and stabilization. An attempt is made to eliminate repeated breakdowns by means of application of a discharge chamber with metal diaphragms. It may be concluded on the basis of the experimental investigations into plasma properties in such chambers that: 1) X-ray radiation, which energy in the axial direction amounts to 700-800 keV, is observed. 2) In the presence of an initial axial magnetic field produced is a hollow plasma filament which collapses slower than without the field. 3) A plasma filament is produced in the form of single- or multi-thread screw configurations with the pressure decrease. 4) Diaphragms eliminate repeated breakdowns and with the breaking of the isolation between them are destructed. The diaphragms do not eliminate repeated breakdowns with the pressure increase. The experiments carried out on the investigation into zet pinch plasma properties in the discharge chamber with the metal diaphragms have shown the advantages of the given design. Further, these advantages may be used to improve the discharge chambers to produce plasma of high temperature.

7002 Fusion Power Plant Technology

REFER ALSO TO CITATION(S) 31823, 32137, 32138, 32140, 32141, 32166, 32167, 32351, 32361, 32362, 32696, 32714, 32715, 32716, 32920

32879 (CONF-810801—59) Overview of fusion reactor safety. Cohen, S.; Crocker, J.G. (Idaho National Engineering Lab., Idaho Falls (USA)). 1981. Contract AC07-76ID01570. 15p. NTIS, PC A02/MF A 01. Order Number DE82005951.

From 6. international conference on structural mechanics in reactor technology; Paris, France (17 Aug 1981).

Use of deuterium-tritium burning fusion reactors requires examination of several major safety and environmental issues: (1) tritium inventory control, (2) neutron activation of structural materials, fluid streams and reactor hall environment, (3) release of radioactivity from energy sources including lithium spill reactions, superconducting magnet stored energy release, and plasma disruptions, (4) high magnetic and electromagnetic fields associated with fusion reactor superconducting magnets and radio frequency heating devices, and (5) handling and disposal of radioactive waste. Early recognition of potential safety problems with fusion reactors provides the opportunity for improvement in design and materials to eliminate or greatly reduce these problems. With an early start in this endeavor, fusion should be among the lower risk technologies for generation of commercial electrical power.

32880 (CONF-810831—80) Preliminary evaluation of beta-spodumene as a fusion reactor structural material. Kelsey, P.V. Jr.; Schmunk, R.E.; Henslee, S.P. (EG and G Idaho, Inc., Idaho Falls (USA)). 1981. Contract AC07-76ID01570. 4p. NTIS, PC A02/MF A01. Order Number DE82006269.

From Fusion reactor materials meeting; Seattle, WA, USA (9 Aug 1981).

Beta-spodumene was investigated as a candidate material for use in fusion reactor environments. Properties which support the use of beta-spodumene include good thermal shock resistance, a very low coefficient of thermal expansion, a low-Z composition which would result in minimum impact on the plasma, and flexibility in fabrication processes. Specimens were irradiated in the Advanced Test Reactor (ATR) to a fluence of 5.3 x 10^{22} n/m^2, E > 0.1 MeV, and 4.9 x 10^{25} n/m^2 thermal fluence in order to obtain a preliminary evaluation of the impact of irradiation on the material. Preliminary data indicate that the mechanical properties of beta-spodumene are little affected by irradiation. Gas production and release have also been investigated.

32881 **(DOE/ER/10107—6) Microstructure of neutron irradiated rapidly solidified Path A Prime-Candidate Alloys.** Arnberg, L.; Megusar, J.; Imeson, D.; Frost, H.J.; Vander Sande, J.B.; Harling, O.K.; Grant, N.J. (Massachusetts Inst. of Tech., Cambridge (USA)). 1981. Contract AS02-78ER10107. 5p. (CONF-810831—69). NTIS, PC A02/MF A01. Order Number DE82006757.

From Fusion reactor materials meeting; Seattle, WA, USA (9 Aug 1981).

A preliminary microstructural characterization has been carried out for Path A Prime Candidate Alloy after neutron irradiation to a dose of about 5 dpa at temperatures from 573 to 873°K. A conventionally processed alloy has been compared with a rapid solidification processed alloy without finding a large difference in the irradiation response at this dose. Both annealed and cold worked states were studied; in addition, a third alloy containing double the TiC content of the Prime Candidate Alloy was evaluated. Voids were observed to form only at temperatures greater than 673°K, with density greater than $10^{21} m^{-3}$ in most cases, except for the cold worked alloys irradiated at 873°K. A large number of small voids were observed, often associated with dislocations or particles, whose future development at higher doses is viewed as critical for a valid comparison between the conventional and rapid solidification processed alloys.

32882 **(DOE/ER/10107—8) Microstructure of rapidly solidified Path A Prime-Candidate Alloys.** Megusar, J.; Arnberg, L.; Vander Sande, J.B.; Grant, N.J. (Massachusetts Inst. of Tech., Cambridge (USA)). 1981. Contract AS02-78ER10107. 5p. (CONF-810831—71). NTIS, PC A02/MF A01. Order Number DE82006755.

From Fusion reactor materials meeting; Seattle, WA, USA (9 Aug 1981).

Path A Prime-Candidate Alloy (PCA) has been rapidly solidified and its composition has been modified by increasing carbon and titanium content. Microstructural examination showed that rapid solidification allowed for a decrease in over-all segregation, elimination of coarse excess phases, an attainment of fine grain size and an increase in supersaturation of carbon and titanium in the PCA alloy. Structural modifications which include a reduction of grain size, an increase in TiC content and control of dislocation structure provide a high density of heterogeneous nucleation sites for helium trapping and are therefore expected to have an effect on swelling and high temperature strength of Path A alloys under irradiation.

32883 **(DOE/ER/10107—10) Failure criteria for fusion-reactor first-wall structural design.** Adegbulugbe, A.O.; Meyer, J.E. (Massachusetts Inst. of Tech., Cambridge (USA)). 1981. Contract AS02-78ER10107. 5p. (CONF-810831—73). NTIS, PC A02/MF A01. Order Number DE82006753.

From Fusion reactor materials meeting; Seattle, WA, USA (9 Aug 1981).

The fusion reactor first walls will be operated under severe conditions, i.e., high temperature and high radiation damage conditions. Because of the demanding conditions in which they must operate, fusion first walls can fail by various modes. Structural design rules are presented to guard against four major possible modes of failure; excessive deformation, cyclic damage at elevated temperature, propagation and growth of flaws, and radiation damage. Lifetime calculations of fusion first walls based on these design rules are presented to demonstrate the application of these rules.

32884 **(DOE/ER/10107—11) Recoil resolution and particle stability under irradiation.** Frost, H.J.; Russell, K.C. (Massachusetts Inst. of Tech., Cambridge (USA)). 1981. Contract AS02-78ER10107. 6p. (CONF-810831—74). NTIS, PC A02/MF A01. Order Number DE82006752.

From Fusion reactor materials meeting; Seattle, WA, USA (9 Aug 1981).

The stability of a dispersion of particles may be affected by resolution due to radiation recoil. Simple models of the diffusion of solute that recoils into the matrix allow an estimate of when this process will be important, leading either to the complete dissolution of the particles or to inverse coarsening in which small particles grow and large particles shrink. We first find the concentration profile for which solute diffuses back to a particle as fast as it is expelled by recoils. The transient concentration profiles in the matrix demonstrate the time required to approach steady state. The solution for a single particle is then used to calculate the rate of inverse coarsening by the diffusion of solute from the region near large particles to the region near small particles. The rate of growth or shrinkage depends directly on the recoil rate and the recoil distance cubed. It depends only weakly on the particle spacing and not at all on the diffusion coefficient.

32885 **(DOE/ER/10107—12) Development of a miniaturized disk-bend test for the determination of postirradiation mechanical properties.** Manahan, M.P.; Argon, A.S.; Harling, O.K. (Massachusetts Inst. of Tech., Cambridge (USA)). 1981. Contract AS02-78ER10107. 6p. (CONF-810831—75). NTIS, PC A02/MF A01. Order Number DE82006751.

From Fusion reactor materials meeting; Seattle, WA, USA (9 Aug 1981).

A Miniaturized Disk Bend Test capable of extracting postirradiation mechanical behavior information from disk-shaped specimens no larger than those used for Transmission Electron Microscopy is currently being developed. Finite element analysis is performed to convert the experimentaly measured load-deflection data into useful engineering information. Since neutron irradiation costs scale with specimen volume, successful development of miniaturized mechanical property tests could provide significant savings in irradiation testing costs for nuclear materials used in fusion and other nuclear technologies. In addition, it may be possible to provide mechanical behavior information which is not ordinarily obtainable due to space limitations in irradiation experiments.

32886 **(DOE/ET/52008—2) Deuterium plasma-material wall interactions. Final report, 1 May 1979-30 September 1981.** Tien, J.K.; Gross, R.A. (Columbia Univ., New York (USA). Plasma Physics Lab.). Oct 1981. Contract AS02-77ET52008. 8p. NTIS, PC A02/MF A01. Order Number DE82007529.

During the final year of this program we completed our study of plasma interactions with material surfaces. Analysis of unipolar arc damage on the microstructure of Ti-6Al-4V was the final part of the study of plasma-metal interactions. Unipolar arcing was found to be the most severe damage mechanism for this alloy and the degree of damage was very sensitive to the metal microstructure. ATJ-S graphite specimens were exposed to hot deuterium plasma and were examined for surface damage. The residual gas in the plasma device was studied using a monopole gas analyzer so as to determine the type and quantity of hydrocarbon species produced by the plasma-graphite interaction.

32887 **(DOE/ET/52018—16) Irradiation response of materials. Final Quarterly technical progress report.** Spitznagel, J.A.; Wood, S.; Choyke, W.J. (Westinghouse Research and Development Center, Pittsburgh, PA (USA)). 16 Oct 1981. Contract AC02-77ET52018. 16p. NTIS, PC A02/MF A01. Order Number DE82006893.

The simultaneous production of helium from (n,α) reactions and atomic displacement damage by energetic neutrons in reactor structural alloys is expected to have a strong influence on their irradiation response for first wall and structural applications in fusion power reactors. Charged particle bombardment offers the possibility of assessing the phenomenology and mechanisms of microstructural evolution in a wide range of materials exposed to simultaneous helium injection and creation of atomic displacement damage by a second ion beam. In this program two ion accelerators have been used to simultaneously focus a beam of helium ions and a second ion beam on targets of selected reactor structural alloys. The resulting microstructural changes have been studied for systematic variations in damage rate, irradiation temperature, fluence and appm helium/dpa ratio and compared and correlated with results from companion fission reactor and high energy neutron irradiation studies conducted elsewhere in the DOE program.

32888 (IFUSP-P—270) Preliminary results of the TBR-small Tokamak. do Nascimento, I.C.; Fagundes, A.N.; da Silva, R.P.; Galvao, R.M.O.; Del Bosco, E.; Vuolo, J.H.; Sanada, E.K.; Dellaqua, R. (Sao Paulo Univ. (Brazil). Inst. de Fisica). May 1980. 18p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700108.

A short description of the TBR - small Brazilian tokamak-and the first results obtained for plasma formation and equilibrium are given. Measured breakdown curves for hydrogen are shown to be confined within analytically calculated limits and to depend strongly on stray vertical magnetic fields. Time profiles of plasma current in equilibrium are shown and compared with the predictions of a simple analytical model for tokamak discharges. Reasonable agreement is obtained taking Z sub(eff) as a free parameter.

32889 (INIS-mf—6769) Electronic system of TBR tokamak device. da Silva, R.P. (Sao Paulo Univ. (Brazil). Escola Politecnica). 1980. 121p. (In Portuguese). NTIS (US Sales Only), PC A10/MF A01. Order Number DE82780224.

Thesis.

The electronics developed as a part of the TBR project, which involves the construction of a small tokamak at the Physics Institute of the University of Sao Paulo, is described. On the basis of tokamak parameter values, the electronics for the toroidal field, ohmic/heating and vertical field systems is presented, including capacitors bank, switches, triggering circuits and power supplies. A controlled power oscillator used in discharge cleaning and pre-ionization is also described. The performance of the system as a function of the desired plasma parameters is discussed. (Author).

32890 (INIS-SU—33) Physical problems of cathode sputtering. Reviews. Pleshivtsev, N.V. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Atomnoj Ehnergii). 1979. 87p. (In Russian). NTIS (US Sales Only), PC A05/MF A01. Order Number DE82700109.

The value of sputtering process of substances by atomic particles in science, engineering and nature is shown in the review. The fundamental problems of cathode sputtering physics are enumerated. Considered is the problem of the first wall of thermonuclear reactor-tokamak and the problem of experimental and theoretical investigation of regularities of the change of sputtering coefficient value depending on the most important parameters of the sputtering process. Directions and problems of immediate investigations of sputtering of substances by ions are shown.

32891 (IPPJ—472) Relaxed condition for purely ohmic ignition in reversed field pinch configurations. Ikuta, K. (Nagoya Univ. (Japan). Inst. of Plasma Physics). Jul 1980. 15p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700110.

The conditions for purely ohmic ignition in reversed field pinch (RFP) configuration is considered in detail. The necessary current for ignition is significantly relaxed if the hot core is sufficiently concentrated near the center of the plasma column.

32892 (IPPJ—473) Anomalous viscosity due to weak turbulence in imploding target plasma. Abe, T.; Niu, K. (Nagoya Univ. (Japan). Inst. of Plasma Physics). Aug 1980. 22p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700111.

The plasma with stress tensor is shown to be unstable for the ion acoustic mode in addition to the electromagnetic mode. These unstable modes are saturated by nonlinear effects, and constitute steady turbulent state. The fluctuations in thus derived turbulence take a role of effective collisions for ion and electron in a plasma, and causes the anomalous viscosity. In the imploding target plasma of ICF, this anomalous mechanism reduces the viscosity to about 10^{-2} times of the classical one.

32893 (ITEF—12(1981)) Charge-exchange method of heavy ion storage for inertial thermonuclear synthesis. Koshkarev, D.G.; Zenkevich, P.R. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Teoreticheskoj i Ehksperimental'noj Fiziki). 1981. 9p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700125.

The method of accelerated heavy ion storage intended for using in thermonuclear plants is proposed. The method is based on application of charge-excharge effect of accelerated in the resonance linear accelerator multicharged ions on negatively charged H^- hydrogen ions. Acceleration of H^- ions is realized in a separate linear accelerator and they are injected in a small storage ring. The H^- ions interact with heavy ions in a special charge-exchange gap, which is common for the H^- storage ring and the heavy ion storage rings system. The dynamics of the ion and H^- storage is considered. Flowsheets and main parameters of the charge-exchange accelerating storage complex estimated for Xe^{+8} ion acceleration up to 20 GeV are given. The conclusion is drawn on the possibility of designing on the basis of the proposed method of a research thermonuclear reactor with a high level of stored energy under low voltage on a linear accelerator.

32894 (JAERI-M—8971) Proceedings of the US/Japan workshop on divertors, first wall materials, and impurity control. Exchange Al in the US-Japan fusion cooperation program. (Japan Atomic Energy Research Inst., Tokyo). Aug 1980. 356p. (CONF-8003163—). NTIS (US Sales Only), PC A16/MF A01. Order Number DE82780209.

From US/Japan workshop on divertors, first wall materials, and impurity control; Tokai, Ibaraki, Japan (17 Mar 1980).

Separate abstracts were entered into the data base for each paper. (MOW)

32895 (JAERI-M—9213) Experiment of long pulse beam injection into cryopump. Shibata, T.; Mizutani, Y.; Okumura, Y.; Sakuraba, J.; Shibanuma, K. (Japan Atomic Energy Research Inst., Tokyo). Dec 1980. 17p. (In Japanese). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700127.

Hydrogen ion beam of 70 keV, 5 A, 10 sec was introduced into the cryopump of 60,000 l/sec in which a beam dump was installed. The pressure in cryopump and evaporation rate of helium were measured during the beam injection. During the beam injection the pressure of hydrogen gas in the cryopump increased from 7.6×10^{-8} Torr to 8.5×10^{-6} Torr. A following explanation of the pressure rise of hydrogen has been tried. The temperature of welded parts of cryopanel rises due to pulse heat loads during beam injection and vapor pressure of hydrogen increases. Therefore welded parts emit the hydrogen gas. In the case of JT-60 neutral beam injector, we will suppress hydrogen gas emission from cryopanel during beam injection by putting a water-cooled sputter shield so that the cryopump does not see the beam dump directly.

32896 (JAERI-M—9242) Detailed analysis of the dynamic behavior of the JT-60 vacuum vessel under the saddle-like electromagnetic forces. Takatsu, H.; Shimizu, M.; Ohta, M.; Imai, K.; Ono, S.; Minami, M. (Japan Atomic Energy Research Inst., Tokyo). Dec 1980. 50p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE82700128.

Dynamic response analyses of the vacuum vessel of JT-60 were carried out under three kinds of saddle-like electromagnetic forces. In the analysis, the dynamic response of the bellows was obtained by dividing it into three components; the first caused by the forced deflection due to the displacement of the adjacent rigid ring, the second caused by the inertia force and the third caused by the saddle-like electromagnetic force. Eigenvalue analyses showed that the typical rotation mode of the rigid ring around the major radius is found at the 20th with the natural frequency of 46.3 Hz. And from the results of the dynamic response analyses, it was shown that the maximum displacement response of the rigid ring is 3.1 mm and the dynamic response is remarkable in case of plasma disruption with time constant of 1 msec. In cases of start-up and plasma disruption with time constant of 50 msec, the rigid ring vibrates quasi-statically.

32897 **(KAERI/RR—275/80) Survey of nuclear fusion technology. A prospect analysis of tokamak fusion research.** Hwang, W.K. (Korea Advanced Energy Research Inst., Seoul (Republic of Korea)). 1981. 74p. (In Korean). NTIS (US Sales Only), PC A04/MF A01. Order Number DE82700131.

The fusion research evaluation model for analyzing various R and D sinarios, the trend analysis of Tokamak research, and the near-term technologies are discussed. The results of the present study are as follows: A computer code, FUSREV, has been developed based on ECON Inc.'s approach. It consists of the plasma power model and the cost/benefit model. Since the State-of-the Knowledges, which are expected to achieve as the result of subproject R and D's, can only be obtained in the form of probability distribution function, Monte-Carlo method is employed. The test computation of the code shows acceptable results. However, FUSREV has been continuously modified employing new models for both technology and economics.

32898 **(NIIEFA-P-K—0470) Prospects of ion hydride application in negative hydrogen ion sources.** Strokach, A.P. (Nauchno-Issledovatel'skij Inst. Ehlektrofizicheskoj Apparatury, Leningrad (USSR)). 1980. 42p. (In Russian). NTIS (US Sales Only), PC A03/MF A01. Order Number DE82700132.

The review on experimental data on negative ion emission by hydrides of alkali and alkali-earth metals is given. Prospects of ion hydride application in negative hydrogen ion sources are analyzed. Requirements to hydride emitters are discussed. On the basis of data on physicochemical properties of ion hydrides and methods of their obtaining. The problems of ion hydride kinetics are considered. The conclusion is drawn that the application of ion hydrides as "accumulators" of negative hydrogen ions is promissing for the development of H^-, D-intensive beam sources. The ion source merits are insignificant gas loading and high efficiency of using generator gas. Systematic investigation of emission of negative hydrogen ions of ion hydrides at various methods of energy supply to hidride targets gives data for the development of most effective sources and their parameter optimization.

32899 **(NIIEFA-P-K—0488) Generation of tubular beams of negative hydrogen ions by a surface plasma source.** Komarov, V.L.; Strokakh, A.P. (Nauchno-Issledovatel'skij Inst. Ehlektrofizicheskoj Apparatury, Leningrad (USSR)). 1980. 12p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700133.

The results of experiments on obtaining a tubular beam of hydrogen negative ions from a surface plasma source with emission ring slit of 100 mm diameter are described in the study. Conditions of burning of a high current ring discharge generating effectively hydrogen negative ions with current density up to 2.1 A/cm^3 are investigated. The possibility of generation of intensive tubular beams of hydrogen negative ions by surface plasma sources is shown, the 2.4 A ion beam is obtained. The results of preliminary experiments on accelerating tubular beam up to 135 keV are described. Azymuthally uniform current density distribution of intensive tubular beams generated by discharges with a close electron drift in a surface plasma source with emission ring slit, absence of high-frequency oscillations in optimal conditions of sources operation as well as the possibility of the most complete use of generated by the discharge negative ions flow show the prospects of development of these sources for fast atom injectors.

32900 **(ORNL/CSD/TM—146) Magnetic field, vector potential, and their partial derivatives due to a current-carrying straight wire of finite length.** Lee, D.K. (Oak Ridge National Lab., TN (USA)). Dec 1981. Contract W-7405-ENG-26. 31p. NTIS, PC A03/MF A01. Order Number DE82007130.

A numerical study is made of a problem dealing with calculation of the magnetic field B vector, the magnetic vector potential A vector, and first partial derivatives of the B vector field and A vector components for two kinds of magnetic sources: (1) current-carrying straight wire of finite length; and (2) current-carrying closed polygon. No restrictions are imposed on the type of the polygon and hence it need not be plane and can consist of arbitrary number of straight wires of arbitrary lengths. Separate consideration of the polygon case makes the numerical procedure more efficient than that based on the linear superposition of the straight-wire sources. All necessary quantities are derived analytically in simple and closed forms without use of any approximations and exact relations are utilized to the greatest possible extent to give an efficient algorithm. Thus, the involved numerical procedures are quite simple, fast, accurate, and straightforward. Results are given in four different coordinate systems (cartesian, cylindrical, spherical, and local toroidal) and results in any other orthogonal coordinates can be obtained with only a few minor modifications.

32901 **(ORNL/Sub—81/21086/2) Engineering design of a toroidal divertor for the EBT-S fusion device. Final report, Phase II. EBT-S divertor project.** Mai, L.P.; Malick, F.S. (Westinghouse Electric Corp., Pittsburgh, PA (USA). Fusion Programs Dept.). 1 Jul 1981. Contract W-7405-ENG-26. 83p. (WFPS-TME—81-026). NTIS, PC A05/MF A01. Order Number DE82007654.

The mechanical, structural, thermal, electrical, and vacuum design of a magnetic toroidal divertor system for the Elmo Bumpy Torus (EBT-S) is presented. The EBT-S is a toroidal magnetic fusion device located at the ORNL that operates under steady state conditions. The engineering of the divertor was performed during the second of three phases of a program aimed at the selection, design, fabrication, and installation of a magnetic divertor for EBT-S. The magnetic analysis of the toroidal divertor was performed during Phase I of the program and has been reported in a separate document. In addition to the details of the divertor design, the modest modifications that are required to the EBT-S device and facility to accommodate the divertor system are presented.

32902 **(UCID—19206) State of work on the AMBAL experiment.** Hamilton, G.W. (Lawrence Livermore National Lab., CA (USA)). 2 Oct 1981. Contract W-7405-ENG-48. 17p. NTIS, PC A02/MF A01. Order Number DE82010991.

A diagram of the AMBAL tandem mirror experiment is given. The main topics discussed are the vapor jet, titanium vaporizer, plasma gun, startup injectors, main injectors, diagnostics, and numerical modeling. (MOW)

32903 **(UCRL—87037) Coatings for laser fusion.** Lowdermilk, W.H. (Lawrence Livermore National Lab., CA (USA)). 18 Dec 1981. Contract W-7405-ENG-48. 32p. (CONF-820107—2). NTIS, PC A03/MF A01. Order Number DE82005698.

From SPIE optical coatings for energy efficiency and solar applications conference; Los Angeles, CA, USA (25 Jan 1982).

Optical coatings are used in lasers systems for fusion research to control beam propagation and reduce surface reflection losses. The performance of coatings is important in the design, reliability, energy output, and cost of the laser systems. Significant developments in coating technology are required for future lasers for fusion research and eventual power reactors.

32904 **(UCRL—87038) High energy laser facilities at Lawrence Livermore National Laboratory.** Holmes, N.C. (Lawrence Livermore National Lab., CA (USA)). Jun 1981. Contract W-7405-ENG-48. 4p. (CONF-810684—56). NTIS, PC A02/MF A01. Order Number DE82006931.

From APS conference on shock waves in condensed matter; Menlo Park, CA, USA (23 Jun 1981).

High energy laser facilities at Lawrence Livermore National Laboratory are described, with special emphasis on their use for equation of state investigations using laser-generated shockwaves. Shock wave diagnostics now in use are described. Future Laboratory facilities are also discussed.

32905 **Hydrogen recycling from stainless steel.** Baskes, M.I. (Sandia National Labs., Livermore, CA (USA). Theoretical Div.). *Journal of Nuclear Materials;* **99**: No. 2/3, 337-339(Sep 1981).

32906 **Release of H and He from TiC, stainless steel, and graphite by pulsed electron and furnace heating.** Picraux, S.T.; Wampler, W.R. (Sandia National Labs., Albuquerque, NM (USA)). *Journal of Nuclear Materials;* **93**: No. 94, 853-860(Oct 1980).

From 4. international conference on plasma surface interactions and controlled fusion devices; Garmisch-Partenkirchen, Germany, F.R. (21 - 25 Apr 1980).

Substantial release of implanted D and ^{3}He from TiC coatings and SS 304, and of D from graphite, by 50 ns pulsed electron beam (e-beam) heating has been observed and is compared to release by isochronal furnace heating. A substantial enhancement in the fractional D release was found for D saturated TiC (0.25 D to host atom ratio) campared with low fluence implants for both e-beam and furnace heating. This enhancement was not observed for graphite and SS 304. E-beam release of ^{3}He from TiC was observed to be unaffected by the presence of saturation concentrations of D. Comparison to the calculated time evolution of the temperature profiles suggests a simple model for the D release based on diffusion-limited release in the case of pulsed e-beam treatments and trap-limited release in the case of furnace bulk heating. These processes are closely related to hydrogen recycle in tokamaks and have implications for T inventory control and He ash removal.

32907 **Model for H^-, D^- production by hydrogen backscattering form alkali and alkali/transition-metal surfaces.** Hiskes, J.R. (California Univ., Livermore (USA). Lawrence Livermore National Lab.); Schneider, P.J. (California Univ., Berkeley (USA). Lawrence Berkeley Lab.). *Journal of Nuclear Materials;* **93**: No. 94, 536-539(Oct 1980).

From 4. international conference on plasma surface interactions and controlled fusion devices; Garmisch-Partenkirchen, Germany, F.R. (21 - 25 Apr 1980).

A model for H^-, D^- production by energetic particles reflecting from metal surface is discussed. The model employs the energy and angular distribution data derived from the Marlowe code. The model is applied to particles incident normally upon Cs, Ni, and Cs/Ni surfaces.

32908 **Trapping, detrapping and replacement of KeV hydrogen implanted into graphite.** Roth, J.; Scherzer, B.M.U. (Association Euratom-Max-Planck-Institut fuer Plasmaphysik, Garching (Germany, F.R.)); Blewer, R.S.; Brice, D.K.; Picraux, S.T.; Wampler, W.R. (Sandia National Labs., Albuquerque, NM (USA)). *Journal of Nuclear Materials;* **93**: No. 94, 601-607(Oct 1980).

From 4. international conference on plasma surface interactions and controlled fusion devices; Garmisch-Partenkirchen, Germany, F.R. (21 - 25 Apr 1980).

Trapping and detrapping of low energy hydrogen isotopes in graphite is relevant to the collection of fuel particles in graphite probes for diagnostics of particle fluxes and energies in the plasma boundary layer, and to the recycling of fuel particles. The measurement of saturation concentrations by depth profiling of D may be influenced by detrapping of deuterium by the analyzing ion-beam. Detrapping yields have been measured for 1 and 8 keV deuterium implanted to saturation concentrations in papyex and pyrolytic graphite at room temperature by 790 keV H^+, 400-2500 keV $^3He^+$, and 400-1600 keV $^{14}N^+$ ions. Initial detrapping yields of 1 keV implanted deuterium by 790 keV $^3He^+$ and $^{14}N^+$ are 4 and 56 D-atoms/ion, respectively. The detrapping yield for $^{14}N^+$-ions increases with increasing energy similar to the electronic stopping power of the ions indicating the influence of electronic excitation on the detrapping mechanism. Detrapping by 790 keV H^+ was found to be negligible.

32909 **Suppression of sputter-induced erosion rate from alkali covered metal surface.** Krauss, A.R.; Gruen, D.M. (Argonne National Lab., IL (USA). Chemistry Div.). *Journal of Nuclear Materials;* **93**: No. 94, 686-691(Oct 1980).

From 4. international conference on plasma surface interactions and controlled fusion devices; Garmisch-Partenkirchen, Germany, F.R. (21 - 25 Apr 1980).

Under the expected conditions of low energy light particle bombardment, atoms sputtered from the first wall of a magnetic fusion device originate almost entirely in the first monolayer of material facing the plasma. It is therefore important to optimize the properties of (at least) the first monolayer so that the sputtered surface introduces the least possible amount of high Z impurity into the plasma. Because of the sheath potential and magnetic fields encountered in a tokamak, sputtered ions are not expected to contribute to plasma contamination. However, the low secondary ion yield of most materials has prevented the use of this effect to reduce the impurity influx. We have produced very thin (monolayer) films of potassium on a molybdenum substrate which sputter with a high ion fraction but do not possess the undesirable properties of high sputtering yield and high vapor pressure associated with bulk alkali metals. The application of an electrostatic field such as would be produced by the sheath potential of a tokamak produces a four-fold reduction in the erosion rate compared with the bulk alkali metal. This result is used to obtain desorption cross sections and surface binding energies which are compared with ion-induced desorption measurements on other adsorbate/substrate systems.

99 GENERAL AND MISCELLANEOUS

9901 Management

32910 **(DOE/MA—0047) Cost and Schedule Control Systems Criteria for Contract Performance Measurement: Systems Review/Surveillance Guide.** (USDOE Assistant Secretary for Management and Administration, Washington, DC. Office of Project and Facilities Management). Nov 1981. 119p. NTIS, PC A06/MF A01. Order Number DE82006099.

DOE Order 2250.1, Cost and Schedule Control Systems Criteria (CSCSC) for Contract Performance Measurement, requires acceptance or validation reviews and subsequent surveillance reviews of contractors' systems to assure initial and continued compliance with the Criteria. This document has been prepared to assist DOE personnel in fulfilling their review responsibilities. Reviews consistent with the guidance contained herein will assure that Criteria objectives are met and that systems continue to function effectively. Contractor compliance with the requirements for work definition, cost and schedule control, and performance reporting will provide increased assurance that a contractor's progress is sufficiently visible to reliably indicate status and to provide the basis for timely and meaningful management decisions.

32911 **(NP—2901108) Institute in 1978.** (Karlsruhe Univ. (TH) (Germany, F.R.)). 1979. 127p. (In German). NTIS (US Sales Only), PC A07/MF A01. Order Number DE82901108.

This annual report 1978 of the Engler-Bunte-Institute basically gives information on scientific work performed in the fields gas, petroleum, coal, petrochemistry, firing technology, water chemistry, as well as on the teaching in these fields. A list of the lectures and publications supplements the above. The activities and special tasks carried out in the Institute in cooperation with industry (particularly gas and water supply undertakings) are briefly outlined.

9902 Mathematics And Computers

REFER ALSO TO CITATION(S) 31949, 32310, 32477, 32491, 32569

32912 **(CNEN-RT/ING—80-27) NENEG: programma per la generazione automatica di reticoli per codici di calcolo ad elementi finiti tridimensionali.** Massini, G. (Comitato Nazionale per l'Energia Nucleare, Rome (Italy)). 1980. 209p. (In Italian). TIC. Order Number DE82902724.

Portions of document are illegible.

NENEG is an automatic mesh generation program for arbitrary structures using three-dimensional finite elements with 8, 16, 20 and 21 nodes, to be used in connection with structural analysis programs like SAP-V, ADINA and BERSAFE (8 and 20 nodes). This report describes the use of NENEG and contains also a number of sample problems with input and output data.

32913 (CONF-811214—6) Distributed resource management: deadlocks. Hayes, R.W. (Oak Ridge National Lab., TN (USA)). 1981. Contract W-7405-ENG-26. 5p. NTIS, PC A02/MF A01. Order Number DE82005193.

From 1981 fall DECUS symposium; Los Angeles, CA, USA (7 Dec 1981).

Many applications require data base management without the need for an entire data base management system. Also, most simple locking mechanisms are not adequate for real-time data acquisition and control applications. This paper presents a basic resource management mechanism which acts as a traffic cop to control access to shared data bases in a real-time system. This mechanism makes use of a deadlock avoidance algorithm to resolve allocation conflicts. The concept of resource management is developed and the problem of system deadlocking is described. Alternatives to the deadlock problem are presented for real-time systems and a modified deadlock avoidance algorithm is developed to provide efficient resource allocation. This algorithm is implemented on an RSX-11M system and is designed for easy expansion to distributed systems. A basic approach to distributed resource management is also presented.

32914 (JINR—9-81-304) GFUN3D program for computerizing three-dimensional magntostatic fields. Borisovskaya, Z.V.; Vorozhtsov, S.B.; Dudareva, T.N. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Problems). 1981. 13p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700478.

The GFUN3D program for computerizing three-dimensional magnetostatic fields by the integral equation method created in the Rutherford Laboratory has been adopted on the CDC-6500 computer of JINR and arranged as a program library. The GFUN3D program is briefly described in order to simplify its application. A set of examples which illustrate the potentialities of the program are given. Basing on the data obtained from calculating three-dimensional fields one can either diminish significantly the effort needed for magnetic field experimental shaping or, certain cases, to omit preliminary modeling of the magnet.

32915 (JINR—E-11-80-782) Numerical generation of orthomonic polynomials of many variables. Gadjokov, V. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Problems). 1981. 17p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700460.

An algorithm of numerical generation of many-dimensional polynomials which are orthomonic with arbitrary weights over a finite real discrete point set is described. Orthonormalization of ordinary many-dimensional linearly-independent monomials is achieved by means of recursion analogous to Forsythe three-term recurrence relation in the case of one dimension. Special attention is paid to the hierarchical order of polynomials obtained. The case of two dimensions is implemented in a package of FORTRAN-4 codes. A numerical example which permits analytical check is considered in detail, and two applications to the problem of data fitting by polynomial series are briefly reported.

32916 (JINR-R—10-81-342) Method of parallel processing in SANPO real time system. Ostrovnoj, A.I.; Salamatin, I.M. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Neutron Physics). 1981. 11p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700483.

A method of parellel processing in SANPO real time system is described. Algorithms of data accumulation and preliminary processing in this system as a parallel processes using a specialized high level programming language are described. Hierarchy of elementary processes are also described. It provides the synchronization of concurrent processes without semaphors. The developed means are applied to the systems of experiment automation using SM-3 minicomputers.

32917 (JINR-R—11-12133) SING-dialoque subsystem for graphical representation of one-dimensional array contents. Karlov, A.A.; Kirilov, A.S. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Computing Techniques and Automation). 1979. 17p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82700461.

General principles of organization and main features of dialogue subsystem for graphical representation of one-dimensional array contents are considered. The subsystem is developed for remote display station of the JINR BESM-6 computer. Some examples of using the subsystem for drawing curves and histograms are given. The subsystem is developed according to modern dialogue systems requirements. It is "open" for extension and could be installed into other computers.

32918 (Juel—1672) Application of an efficient algorithm for the numerical Laplace inversion. Honig, G.; Hirdes, U. (Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.). Inst. fuer Festkoerperforschung). Aug 1980. 54p. NTIS (US Sales Only), PC A04/MF A01. Order Number DE82780290.

The theory and the application of a new inversion procedure are described. The procedure is based on a Fourier series expansion and achieves, compared with other inversion methods, a very high accuracy with only a few function evaluations of the Laplace transform. This is due to some efficient algorithms reducing the discretization and truncation error of the Fourier series approximation and an algorithm determining the optimal parameters of the procedure. Furthermore, the variety of algorithms offered by the new inversion procedure allows its successful application in a very big range of applications. The procedure is implemented as a FORTRAN subroutine called LAPIN.

32919 (LA-UR—81-3558) Network file-storage system. Collins, W.W.; Devaney, M.J.; Willbanks, E.W. (Los Alamos National Lab., NM (USA)). 1982. Contract W-7405-ENG-36. 5p. (CONF-820204—1). NTIS, PC A02/MF A01. Order Number DE82006108.

From COMPCON '82 meeting; San Francisco, CA, USA (Feb 1982).

The Common File System (CFS) is a file management and mass storage system for the Los Alamos National Laboratory's computer network. The CFS is organized as a hierarchical storage system: active files are stored on fast-access storage devices, larger, less active files are stored on slower, less expensive devices, and archival files are stored offline. Files are automatically moved between the various classes of storage by a file migration program that analyzes file activity, file size and storage device capabilities. This has resulted in a cost-effective system that provides both fast access and large data storage capability (over five trillion bits currently stored).

32920 (ORNL/CSD/TM—166) EBT data acquisition system control facilities. Burris, R.D. (Oak Ridge National Lab., TN (USA)). Jan 1982. Contract W-7405-ENG-26. 24p. NTIS, PC A02/MF A01. Order Number DE82007470.

A multicomputer, multitask data acquisition and analysis system has been implemented for the Elmo Bumpy Torus (EBT) experiment in controlled fusion. This document describes the control features of the computer system, including the provision of time and date to all computers, the control of data file names, the maintenance of critical data bases, and the control of various tasks. The physical control of the experiment itself, through the provision of voltages or the sensing of conditions, is not described in this document.

32921 (PNL-SA—9984) Service-interruption reporting. Mathieu, T.J. (Pacific Northwest Lab., Richland, WA (USA)). Oct 1981. Contract AC06-76RL01830. 8p. (CONF-811214—5). NTIS, PC A02/MF A01. Order Number DE82005934.

From 1981 fall DECUS symposium; Los Angeles, CA, USA (7 Dec 1981).

Service interruption is a subject of importance to computer system managers in evaluating the availability of a computer system to its users. A set of programs has been developed at Battelle that monitors system up and down time, enables the system manager to identify the cause of each down period, and produces detail and summary reports analyzing the availability of the system. This paper will describe those programs and reports and give some examples of their output.

32922 (SAND—80-2056) User's manual for the AMEER flight path-trajectory simulation code. Meyer, E.J. (Sandia Labs., Albuquerque, NM (USA)). Oct 1981. Contract AC04-76DP00789. 187p. NTIS, PC A09/MF A01. Order Number DE82007004.

A guide to the use of the AMEER (Aero-Mechanical Equations Evaluation Routines) flight path-trajectory simulation code is presented. The input data requirements, computed output data available, code control features, and code flow logic are described for a rigid-body six-degree-of-freedom or point mass simulation.

32923 (SAND—81-1927) Code for Dinic's maximum flow algorithm. Slater, P.J. (Sandia National Labs., Albuquerque, NM (USA)). Nov 1981. Contract AC04-76DP00789. 28p. NTIS, PC A03/MF A01. Order Number DE82007558.

This report is a guide for the users of a subroutine for finding the maximum value of a source to sink flow in a network. The code, MAXFLO, implements an algorithm of E.A. Dinic which is a path augmenting flow algorithm with modifications on the basic maximum flow algorithm of Ford and Fulkerson. Dinic's algorithm was chosen for implementation because comparative studies indicated that this would provide the smallest average run time for a maximum flow computation.

32924 (SAND—81-2476) Remote job entry (RJE) for VAX/VMS user guide. Samuelson, N.H.; Brown, C.D. (Sandia National Labs., Albuquerque, NM (USA)). Nov 1981. Contract AC04-76DP00789. 30p. NTIS, PC A03/MF A01. Order Number DE82006878.

At Sandia National Laboratories in Albuquerque, New Mexico, a group of CDC computers handle large computational (batch) jobs. Some DEC VAX systems have been connected to the CDC systems to provide pre- and postprocessing of batch jobs. To facilitate running jobs on the CDC systems, members of Division 2644 created a Remote Job Entry (RJE) system. This document describes procedures for using that system.

32925 (SAND—82-0061C) Type-insensitive ODE codes. Shampine, L.F. (Sandia National Labs., Albuquerque, NM (USA)). 1981. Contract AC04-76DP00789. 16p. (CONF-811219—1). NTIS, PC A02/MF A01. Order Number DE82006295.

From 1. Latin American conference on applied mathematics; Santiago, Chile (14 Dec 1981).

The numerical solution of the initial value problem is reviewed in the classical situation of Lipschitz constant which is not large, and some aspects of the solution of problems with large Lipschitz constants are considered. It is hoped that the concept of stiffness is clarified by this review. It was shown that it is feasible to write codes which recognize and respond effectively to the type of the problem. The efficiency of such codes is insensitive to the changing of type in the course of an integration.

32926 (SLAC-PUB—2835) FASTBUS demonstration systems. Paffrath, L.; Bertolucci, B.; Deiss, S. (Stanford Linear Accelerator Center, CA (USA); Fermi National Accelerator Lab., Batavia, IL (USA); Illinois Univ., Urbana (USA)). Oct 1981. Contract AC03-76SF00515. 4p. (CONF-811012—48). NTIS, PC A02/MF A01. Order Number DE82005273.

From IEEE symposium on nuclear science; San Francisco, CA, USA (21 Oct 1981).

This paper will provide a demonstration of basic FASTBUS hardware and test software. The systems will include single crate segments, simple computer I/0, a fast sequencer and memory, some simple diagnostic and display devices and a UNIBUS to FASTBUS processor interface. The equipment will be set up to show the basic FASTBUS protocols and timing transactions, as well as some of the general initialization software features.

32927 (UCID—19268) TRANSF code user manual. Weaver, H.J. (Lawrence Livermore National Lab., CA (USA)). 1 Nov 1981. Contract W-7405-ENG-48. 37p. NTIS, PC A03/MF A01. Order Number DE82006929.

The TRANSF code is a semi-interactive FORTRAN IV program which is designed to calculate the model parameters of a (structural) system by performing a least square parameter fit to measured transfer function data. The code is available at LLNL on both the 7600 and the Cray machines. The transfer function data to be fit is read into the code via a disk file. The primary mode of output is FR80 graphics, although, it is also possible to have results written to either the TTY or to a disk file.

32928 (UCRL—86341) Applying structured analysis in a real-time data acquisition environment. Storch, N.A. (Lawrence Livermore National Lab., CA (USA)). 5 Nov 1981. Contract W-7405-ENG-48. 11p. (CONF-811168—1). NTIS, PC A02/MF A01. Order Number DE82006795.

From Hewlett-Packard-1000 international users group conference; College Park, MD, USA (30 Nov 1981).

In order to cut the long term software costs and have a system which more closely meets our users' needs, we are applying structured analysis and design to our real-time data acquisition environment. This paper describes our experiences. We have been able to communicate top level software design to our users and in turn to make modifications based on their inputs. The structured approach has made it easier for people working on independent, but related projects to review designed programs and data bases. Structured analysis and design has become the basis of an internal standard which software team members use to relate their work to the on-going work of others. The structured approach has made possible readable and consistent documentation of the system.

32929 (UCRL—86500) EPROM-based LSI-11 for distributed instrumentation control. Hunt, D.N. (Lawrence Livermore National Lab., CA (USA)). 11 Nov 1981. Contract W-7405-ENG-48. 7p. (CONF-811214—4). NTIS, PC A02/MF A01. Order Number DE82006742.

From 1981 fall DECUS symposium; Los Angeles, CA, USA (7 Dec 1981).

The LLNL Nuclear Chemistry Counting Facility (NCCF) is being converted to a modern production facility. A computer network has been designed and built to implement this conversion. The outermost node of the computer network is a dedicated EPROM-based controller. The controller handles the details of driving the attached nuclear instrumentation, providing a standard interface to the remainder of the network. This paper addresses the design and the implementation of the dedicated instrumentation controller.

32930 (UIUCDCS-R—81-1064) Solving ordinary differential equations with discontinuities. Gear, C.W.; Osterby, O. (Illinois Univ., Urbana (USA). Dept. of Computer Science). Sep 1981. Contract AS02-76ER02383. 70p. (UILU-ENG—81-1724). NTIS, PC A04/MF A01. Order Number DE82006906.

An algorithm is described that can detect and locate some discontinuities and provide information about their size, order and position. However, the success of the algorithm is strongly dependent on the location of the discontinuity with respect to the steps that straddle it. The major advantage of the scheme appears to be that a more reliable error estimate can be used when a discontinuity is present so that codes will be more robust. In some cases significant savings may accrue but it appears that a better restarting procedure than the one used will be necessary to realize most of those benefits.

32931 (USC—113P19-78) Games of protocol. Marchi, E. (University of Southern California, Los Angeles (USA). Dept. of Electrical Engineering). Feb 1974. Contract AT03-76ER70019. 27p. NTIS, PC A03/MF A01. Order Number DE82005346.

This paper is concerned with the dynamic or multistage processes where the competition is taking place at each step and its result will determine the forthcoming steps. One of the easier (but very realistic) dynamic situations occurs when the different groups in the competition perform their actual moves, or make their decisions in an ordered sequence, one after the other. Such an abstract is called a univalent game of protocol. The purpose of the first sections is to study such processes. The first one introduces an existence theorem regarding stable points which are seen as dynamic solutions of the dynamic competition. They are very general and are

related with the concept of competitive structure. The next two sections present some decomposition techniques which are also useful for computational purposes.

32932 **(USC—113P-66) Invariant imbedding, method of characteristics, and parameter estimation.** Lee, E.S.; Vasudevan, R.; Wang, K.M. (University of Southern California, Los Angeles (USA). Dept. of Electrical Engineering). Sep 1973. Contract AT03-76ER70019. 11p. NTIS, PC A02/MF A01. Order Number DE82005362.

Parameter estimation in a physical system from observed data is carried out by a method which combines invariant imbedding formalism and the method of characteristics. This avoids the necessity of making use of an initial guess for the parameter necessary if one adopts quasilinearization techniques. Numerical results for a simple one parameter system is presented.

9903 Information Handling

32933 **(DOE/TIC—7000-R5(App.)) Energy Data Base: Subject Thesaurus Permutated Listing.** (Department of Energy, Oak Ridge, TN (USA). Technical Information Center). Oct 1981. 240p. NTIS, PC A11/MF A01. Order Number DE82005770.

Entry to a large multidisciplinary thesaurus containing both single and multi-word descriptors presents problems to the experienced as well as the new user. This permutated listing was prepared to alleviate these problems. Each descriptor has been permutated according to each significant word in single and multi-word entries and listed alphabetically. This type listing will: (1) provide the user with the correct thesaurus entry; and (2) permit review of generically related descriptors separated by alphabetization in the Thesaurus.

CORPORATE AUTHOR INDEX

In the Corporate Index, report literature is indexed using the name of the organization or institution responsible for issuing the report. Headings are provided for all report literature and for published literature for which a corporate approach is especially desirable, e.g., symposium and conference proceedings.

Each entry under a corporate heading gives the report title and the volume and abstract numbers. Report numbers, if applicable, are given in parentheses at the end of the entry.

DOE Energy Information Data Base: Corporate Author Entries (DOE/TIC-4585) is used in the standardization of corporate entries. DOE/TIC-4585 is available for purchase from the National Technical Information Service (NTIS), U. S. Department of Commerce, Springfield, Virginia 22161.

A

Academia Sinica, Beijing (China). Inst. of High Energy Physics
Development and performance of a high pressure hydrogen time projection chamber, 7:32369 (DOE/ER/40033—13)

Acurex Corp., Mountain View, CA (USA). Energy and Environmental Div.
Identification of solid wastes in geothermal operations. Acurex draft final report 80-70/EE, 7:31895 (DOE/SF/10838—T1)

Aerojet Energy Conversion Co., Sacramento, CA (USA)
Combustion enhancement and pollutant control research with acoustically induced mixing. Technical progress report, September 1981-December 1981, 7:31741 (DOE/PC/40270—3)

AiResearch Mfg. Co., Los Angeles, CA (USA)
Near-term electric-vehicle program. Phase II. Mid-term review summary report, 7:32128 (DOE/CS/51213—T20)

Alabama Geological Survey, University (USA)
Ground-water levels in Alabama. For observation wells measured periodically, August 1952-July 1977. Circular 105, 7:32595 (NP—2902469)

Allis-Chalmers Corp., York, PA (USA). Hydro-Turbine Div.
Powerhouse-gate: concept definition study, 7:31832 (DOE/ID/12200—T1)

Alsthom, 75 - Paris (France)
French electromechanical industry in the nuclear sector, 7:31915 (FRNC-CONF—206)

Amsterdam Univ. (Netherlands)
Focal plane camera for celestial XUV sources, 7:32397 (INIS-mf—6833)
Multi trace element analysis of dry biological materials by neutron activation analysis including a chemical group separation, 7:32192 (INIS-mf—6831)

AN Ehstonskoj SSR, Tartu. Inst. Astrofiziki i Fiziki Atmosfery
Teleradiometer for remote atmospheric sensing in near infrared spectr spectral region, 7:32398 (INIS-SU—60)

AN Gruzinskoj SSR, Tbilisi. Inst. Fiziki
Proceedings of the 7. Bakurianian school on radiation physics of metals and alloys, 7:32152 (INIS-SU—61)

AN SSSR, Moscow. Nauchnyj Sovet po Probleme Radiatsionnaya Fizika Tverdogo Tela
Proceedings of the 7. Bakurianian school on radiation physics of metals and alloys, 7:32152 (INIS-SU—61)

AN Ukrainskoj SSR, Kharkov. Fiziko-Tekhnicheskij Inst.
General and nuclear physics, 7:32874 (KFTI—80-37)
Influence of the grain size on the characteristics of high-temperature plastic deformation of beryllium, 7:32155 (KFTI—81-15)
Ion acceleration in heavy-current electron beam injected in neutral gas, 7:32353 (KFTI—80-45)
Physical experiment technique, 7:32708 (KFTI—80-46)
Physics of radiation damage and radiation material science, 7:32815 (KFTI—80-48)

AN Ukrainskoj SSR, Kiev. Inst. Teoreticheskoj Fiziki
Influence of the collisions of electrons and ions with atoms and molecules on the dynamic form-factors of bounded many-particle systems, 7:32871 (ITP—80-108-E)

AN Ukrainskoj SSR, Kiev. Inst. Yadernykh Issledovanij
Laser application for detector system adjustment in a reaction chamber, 7:32416 (KIYI—80-8)
Neutron physics. Part 1. Proceeding of the 5. All-union conference on neutron physics, 7:32811 (INIS-SU—40)

Argonne National Lab., IL (USA)
Effects of atmospheric deposition of energy-related pollutants on water quality: a review and assessment, 7:32478 (ANL/AA—26)
OTEC biofouling, corrosion, and materials study from a moored platform at Punta Tuna, Puerto Rico, 7:31864 (ANL/OTEC-BCM—023)
Solid-state high common-mode battery cell voltage scanner: design report, 7:32127 (ANL/OEPM—81-7)

Arizona Solar Energy Commission, Phoenix (USA)
Geothermal Development Plan: Pima County, 7:31881 (DOE/RA/50076—T12)

Arizona Univ., Tucson (USA). Dept. of Chemical Engineering
Geothermal Development Plan: Pima County, 7:31881 (DOE/RA/50076—T12)

Associated Universities, Inc., Washington, DC (USA)
History of attempts to quantify environmental mutagenesis, 7:32586 (BNL—30356)

Atomic Energy Board, Pelindaba, Pretoria (South Africa)
Computerised information system for the processing of borehole data with regard to uranium sources in the Republic of South Africa, 7:31785 (PER—61)
Effect of elastically scattered protons on the energy resolution of x-ray detectors in PIXE measurements, 7:32420 (PEL—277)
In vivo measurement of uranium in the human chest under high background conditions, 7:32419 (PEL—275)

Atomic Energy of Canada Ltd., Chalk River, Ontario. Chalk River Nuclear Labs.
Eddy-current testing: manual on eddy-current method, 7:32442 (AECL—7523-Vol.1)

Australian Atomic Energy Commission Research Establishment, Lucas Heights
Preparation of thin targets of ^{239}Pu, ^{233}U and ^{235}U by the method of electrospraying, 7:32228 (AAEC/E—512)

Australian Radiation Lab., Melbourne
Natural radioactivity in the production of titanium dioxide pigment: a study of the Laporte Plant and environment behaviour of radionuclides at Bunbury, Western Australia, 7:32504 (ARL/TR—037)
Quality assurance of radiopharmaceuticals-specifications and test procedures, 7:32229 (ARL/TR—034)

Automation Industries, Inc., Silver Spring, MD (USA). Vitro Labs. Div.
Corrosion and scaling in solar heating systems, 7:31874 (SOLAR/0909—81/70)

B

Baker (Michael), Jr., Inc., Beaver, PA (USA)
State-of-the-art of FGD sludge fixation. Final report, 7:31727 (EPRI-FP—671-Vol.3)

Ball State Univ., Muncie, IN (USA). Wind Energy Research Team
Development of slide program describing site-selection process for Small Wind Energy Conversion Systems (SWECS), 7:31899 (DOE/R5/10301—1)
Bendix Corp., Kansas City, MO (USA)
Environmental chamber low temperature cutoff. Final report, 7:32248 (BDX—613-2722)
Molybdenum and its analyses, 7:32132 (BDX—613-2730)
Bendix Field Engineering Corp., Grand Junction, CO (USA)
NURE aerial gamma-ray and magnetic detail survey: Midnite-Sherwood Mines, Washington area. Final report, 7:31778 (GJBX—182-Vol.2B(Midnite))
NURE aerial gamma-ray and magnetic detail survey: Mt. Leona-Nancy Creek, Washington area. Final report, 7:31782 (GJBX—182-Vol.2B(Mt.Leona))
Bituminous Coal Research, Inc., Monroeville, PA (USA)
Longwall data bank. Semiannual project report, May 28-November 28, 1981, 7:31733 (DOE/FE/00080—2)
Bochum Univ. (Germany, F.R.). Abt. Maschinenbau und Konstruktiven Ingenieurbau
Simulation of a two-cycle engine and optimization of its gas-dynamic parameters of influence by means of a direct research method, 7:32126 (NP—2901109)
Boeing Computer Services Co., Seattle, WA (USA)
Intermediate photovoltaic system application experiment operational performance report. Volume 5. Newman Power Station Site, El Paso, TX, 7:31859 (SAND—81-7086/5)
Intermediate photovoltaic system application experiment operational performance report. Volume 4 for Mt. Laguna Radar Station, Mt. Laguna, CA, 7:31860 (SAND—81-7090/4)
Bonneville Power Administration, Portland, OR (USA)
Energy conservation management conference, 7:32089 (CONF-810370—)
Booz, Allen and Hamilton, Inc., Bethesda, MD (USA)
Solar central receivers: the technology, industry, markets, and economics, 7:31862 (DOE/SF/11436—1-Exect.Summ.)
Brandeis Univ., Waltham, MA (USA)
Nucleic acid-protein interactions: conformational studies. Progress report, September 1, 1978-August 31, 1981, 7:32541 (DOE/EV/04962—3)
Brookhaven National Lab., Upton, NY (USA)
Analysis of selected surface characteristics and latent heat storage for passive solar space heating, 7:31866 (BNL—30441)
Assessment of regional glucose metabolism in aging brain and dementia with positron-emission tomography, 7:32540 (BNL—30551)
Atomization characteristics of coal slurries. First quarterly report, September 1-November 30, 1981, 7:31739 (DOE/TIC—2006853)
Data acquisition and experiment control system for high-data-rate experiments at the National Synchrotron Light Source, 7:32327 (BNL—30337)
Environmental Chemistry Division annual report, 7:32479 (BNL—27818)
History of attempts to quantify environmental mutagenesis, 7:32586 (BNL—30356)
Interaction of the atmospheric boundary layer with large-scale processes over the Bay of Bengal during MONEX79, 7:32472 (BNL—30322)
Phase transitions and elementary-particle physics, 7:32752 (BNL—30432)
Photovoltaics and electric utilities, 7:31834 (SAND—81-7027)
Survey of carbon and its role in phosphoric-acid fuel cells. Final report, 7:32108 (BNL—51418)
Systems analysis of hydrogen supplementation in natural gas pipelines, 7:31771 (BNL—30440)
Water-compatible polymer concrete materials for use in rapid repair systems for airport runways. Final report, 7:32177 (BNL—51390)
Brown Boveri Reaktor G.m.b.H., Mannheim (Germany, F.R.)
PWR reactors for BBR nuclear power plants, 7:31935 (INIS-mf—6840)
Brown Univ., Providence, RI (USA)
Investigation of the tensile deformation and fracture of a dual-phase steel, 7:32143 (DOE/ER/10556—86)
Bundesministerium fuer Forschung und Technologie, Bonn (Germany, F.R.)
Development of a modularized battery, 7:32070 (NP—2901049)
Joint research promotion by Bund and Laender. Cooperation between Bund and Laender in the joint project of research promotion according to Article 91 b, GG, 7:32084 (NP—82901096)
Nb-Ti base high-field superconductors with current capacities in excess of 3000 A for application in magnet systems with alternating field components, 7:32844 (BMFT-FB-T—81-009)
Bundesministerium fuer Wirtschaft, Bonn (Germany, F.R.)
Data on the development of the West German power industry in 1979, 7:32103 (NP—2901052)
Ordinance on energy-saving thermal insulation of buildings. Thermal Insulation Ordinance (Waermeschutz V). Dated from August 11, 1977, 7:32115 (NP—2901002)
Bundesministerium fuer Wirtschaft, Bonn (Germany, F.R.). Referat Presse und Information
More kilometers with less gasoline, 7:32090 (NP—2901085)
Bundesstelle fuer Aussenhandelsinformation, Koeln (Germany, F.R.)
Market for drilling rigs (petroleum, natural gas), 7:31751 (NP—2901091)

C

California Div. of Oil and Gas, Sacramento (USA)
Drilling and operating oil, gas, and geothermal wells in an H_2S environment, 7:31892 (NP—2902054)
California Inst. of Tech., Pasadena (USA)
Recent results on total neutrino and antineutrino cross sections by the CFRR collaboration, 7:32724 (FERMILAB-Conf—81/80-Exp.)
California Univ., Los Angeles (USA). Lab. of Biomedical and Environmental Sciences
Environmental effects of solar thermal power systems: ecological observations during construction of the Barstow 10 MWe pilot STPS, 7:31863 (UCLA—12/1311)
Canadian Nuclear Association, Toronto, Ontario
Heat exchanger reliability. Proceedings of a seminar, 7:31938 (INIS-mf—6612)
Carnegie-Mellon Inst. of Research, Pittsburgh, PA (USA)
Assessment of health, safety and environmental impacts of DOE coal conversion process. First technical progress report, 2 July 1980-31 March 1981, 7:31746 (DOE/ET/14746—1)
Carnegie-Mellon Univ., Pittsburgh, PA (USA)
Report of the economic study panel of the inexhaustible resources study. Report No. CMU No. 1-53083, 7:32104 (DOE/ET/20091—1)
Carson Helicopters, Inc., Perkasie, PA (USA)
NURE aerial gamma ray and magnetic detail survey of portions of northeast Washington. Final report, 7:31777 (GJBX—1-82)
NURE aerial gamma-ray and magnetic detail survey: Midnite-Sherwood Mines, Washington area. Final report, 7:31778 (GJBX—182-Vol.2B(Midnite))
NURE aerial gamma-ray and magnetic detail survey: Mt. Leona-Nancy Creek, Washington area. Final report, 7:31782 (GJBX—182-Vol.2B(Mt.Leona))
CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France). Dept. des Etudes Mecaniques et Thermiques
Progressive buckling. First series of experiments, 7:31977 (CEA-N—2213)
Center for Energy and Environment Research, Mayaguez (Puerto Rico)
OTEC biofouling, corrosion, and materials study from a moored platform at Punta Tuna, Puerto Rico, 7:31864 (ANL/OTEC-BCM—023)
Centro Brasileiro de Pesquisas Fisicas, Rio de Janeiro
Conjecture on the critical frontier of the ferromagnetic Potts model on planar lattices, 7:32179 (CBPF-NF—029/80)
Conjecture on the critical frontier of the fully anisotropic homogeneous quenched bond-mixed potts ferromagnet in square lattice, 7:32178 (CBPF-NF—023/80)
Convergence problems and energetic regions in π excited states of certain conjugated molecules, 7:32691 (CBPF-A—0005/80)
Electronic structure and Moessbauer hyperfine interactions of Au (I) compounds, 7:32827 (CBPF-A—0022/80)
Electronic structure and Moessbauer isomer shift of the iron atom isolated in crystalline argon matrix, 7:32690 (CBPF-A—0004/80)

Induced magnetism via conduction electron exchange; application to $PrAl_2$, 7:32134 (CBPF-A—0021/80)
Magnetic behavior of Van Vleck ions and an electron gas interacting by exchange, 7:32692 (CBPF-A—0007/80)
ns-ms excitation of alkali atoms in the Glauber approximation, 7:32133 (CBPF-A—0017/80)
Random magnetism, 7:32825 (CBPF-A—0010/80)
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Design for a small-scale fuel-alcohol plant, 7:31841 (EGG-M—04481)
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Preliminary evaluation of beta-spodumene as a fusion reactor structural material, 7:32880 (CONF-810831—80)
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Multiple scattering in thin layers of substance, 7:32806 (EFI—431(38)-80)
Program controlled system for measuring and monitoring the electron coherent radiation spectrum of Yerevan synchrotron, 7:32370 (EFI—398(5)-80)
Simulation of neutron detection process in modular detectors, 7:32371 (EFI—401(8)-80)
Soliton excitation in a nonisothermal electron-ion plasma by electron bunch with given parameters, 7:32849 (EFI—442(49)-80)
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Calculation of the load from short circuit currents in high-voltage systems with non-bunched conductor cables, 7:31912 (NP—2901106)
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FASTBUS demonstration systems, 7:32926 (SLAC-PUB—2835)
Recent results on total neutrino and antineutrino cross sections by the CFRR collaboration, 7:32724 (FERMILAB-Conf—81/80-Exp.)
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Computer aided extractor design for the RIG 10 high intensity ion source, 7:32328 (GKSS—80/E/33)
Interlaboratory niobium dosimetry comparison. The contribution of the GKSS-Forschungszentrum Geesthacht, 7:32374 (GKSS—80/E/36)
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Algorithm and computer code for calculating the swelling of the fuel elements with a ceramic fuel, 7:31992 (IAE—3275/5)
ATOS-the installation for atom collision investigation, 7:32765 (IAE—3363/7)
Classical transfer coefficients in a plasma with impurities, 7:32853 (IAE—3309/6)
Computer code for neutron group calculation of a cylindrical reactor cell (NEGR-Ts), 7:31969 (IAE—3377/5)
Defect formation in semiconductors under ion bombardment, 7:32809 (IAE—3261/11)

Derivation of the finite difference equations for a heterogeneous reactor. 1. Square lattice blocks, 7:31968 (IAE—3280/5)
Efficiency of plasma electron cyclotron-resonance heating in the TM-3 tokamak, 7:32855 (IAE—3324/7)
Foundation of the technique for assessment of radiation consequences of nuclear power plant accidents, 7:32537 (IAE—3144)
Interference effects in Moessbauer spectra of M1-transitions, 7:32772 (IAE—3313/1)
Orientation ordering (anti k=0) in interstitial solid solutions on the base of cubic (C-15) Laves phases, 7:32833 (IAE—3308/9)
Physical problems of cathode sputtering. Reviews, 7:32890 (INIS-SU—33)
Possibility of application of crystals scintillators on the basis of ammonium iodides and other analogous compounds as fast neutron detectors, 7:32389 (IAE—3281/2)
Possibility of chromatographic separation of curium and californium on phosphorus- and phosphorus-nitrogen-containing ionites, 7:32191 (IAE—3303/13)
Semianalytical method of nonstationary thermal problem solution for a pipeline with an incompressible coolant, 7:31946 (IAE—3288/5)
Stabilization of a vertical instability by a feedback system at the T-12 installation, 7:32852 (IAE—3268/7)
Study of the tunnel junctions on vanadium base, 7:32149 (IAE—3338/10)
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Neutron spectra measuring by magnetless hadron spectrometer, 7:32399 (ITEF—159(1980))
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Scattering integral equations and four-nucleon problem. Integral equations for Weinberg quasiparticles, 7:32799 (ITEP—13(1981))
Test calculations of physical parameters of the TRX,BETTIS and MIT critical assemblies according to the TRIFON program, 7:31971 (ITEF—164(1980))
Units of reprogramming memory devices in the Camac-Vector systems, 7:32449 (ITEF—112(1980))
Xenon bubble chamber image processing on the POISK installation in the man-machine dialog regime, 7:32400 (ITEF—168(1980))

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Computer code for calculating reactor core optimal physical performances. POISK-2, 7:31965 (FEI—1110)
Determination of quantity performances of the parametric reliability for unique objects, 7:31914 (FEI—1126)
DOPPLER program for calculating the Doppler temperature reactivity coefficient, 7:31964 (FEI—1097)
Droplet size effect on heat and mass transfer characteristics of two-phase flow in a post-CHF boiling regime. Results of a numerical experiment, 7:31982 (FEI—1128)
Electric conductivity of titanium, zirconium, hafnium and its alloys. Communication 1, 7:32147 (FEI—1149)
Electrochemical cell for measuring oxygen activity in liquid sodium, 7:31945 (FEI—1061)
Evaluation of the axial elongation of a can of a fuel rod in the RBMK-type reactor under the conditions of cyclic power variation, 7:31936 (FEI—1089)
Experimental study of specific fluorescence features of organic scintillators during their interactions with fast neutrons and gamma-quanta, 7:32372 (FEI—1099)
Impurities diffusion in binary titanium-zirconium and titanium-aluminium alloys in a bcc solid-solution range, 7:32146 (FEI—1145)
Inelastic neutron scattering study on crystal lattice dynamics of vanadium-oxygen interstitial solid solutions, 7:32171 (FEI—1109)
Inertial and damping properties of a two-phase mixture with surface-active agents, 7:31981 (FEI—1104)
Investigation into carbon diffusion in multicomponent iron alloys with chromium, nickel, molybdenum and niobium in the range of γ-solid solutions, 7:32145 (FEI—1113)
Ksub(eff) calculation by the variable separation method, 7:31963 (FEI—1079)
Long-term strength of Kh13M2S2 in biaxial stressed state, 7:32144 (FEI—1046)
Model of diffusion of metals. 2. Effect of polymorphic transformations on self-diffusion parameters, 7:32232 (FEI—1094)
Numerical technique for calculating coolant velocity and temperature fields in a nuclear reactor, 7:31980 (FEI—1100)
On-line system for study of the physical performances of the BFS critical assemblies on the M-6000 computer basis, 7:31999 (FEI—1022)
Program for calculating the temperature fields in constructive elements of nuclear reactors, 7:31979 (FEI—1019)
Some problems of the neutron flux increase in a fast research reactor, 7:32000 (FEI—1069)
Study on inelastic scattering spectra of slow neutrons in yttrium-aluminium garnet crystals with rare earth additions, 7:32807 (FEI—1130)
Synthesis of porous vortex free bodies as a hydrodynamical design problem, 7:31991 (FEI—1095)
To calculating plane cells by means of the $2P_0$-approximation, 7:31966 (FEI—1138)

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Effect of electron beam parameters on the coherent bremsstrahlung in monocrystals, 7:32810 (IFVE-OP—81-17)
European hybrid spectrometer. Part D: hadron calorimeters, 7:32395 (IFVE-OEIPK—80-143)
Evaluation of shower parameters by the moments method in hodoscope calorimeters, 7:32393 (IFVE-OEF—81-45)
GAMS-200 hodoscope gamma spectrometer, 7:32392 (IFVE-OEF—80-141)
High resolution Cherenkov counter with liquid radiator, 7:32394 (IFVE-OEF—81-63)
Optimization of drift chamber parameters with wide drift gaps using $Ar+CO_2$ working mixture, 7:32396 (IFVE-ONF—81-24)

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Reports of the Arbeitsgruppe Neutronenstreuung, 7:31967 (HMI-B—332)

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Economic-impact study of proposed IPCB amendments to water-pollution regulations, R80-6. Document No. 82/06, 7:32096 (NP—2903327)
Illinois synthetic-fuels facilities-siting survey. Document No. 81/36, 7:32524 (NP—2903328)

Illinois Univ., Urbana (USA)
FASTBUS demonstration systems, 7:32926 (SLAC-PUB—2835)
Many-body effects on the x-ray spectra of metals, 7:32828 (DOE/ER/01198—1372)

Illinois Univ., Urbana (USA). Dept. of Computer Science
Numerical simulation of semiconductor devices, 7:32304 (UIUCDCS-R—81-1072)
Solving ordinary differential equations with discontinuities, 7:32930 (UIUCDCS-R—81-1064)

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Conversion of kerogen of Eastern US oil shale by tetralin and hydrogen, 7:31773 (CONF-820217—5)
Development of a pressurized biomass gasification process, 7:31835 (CONF-810865—10)

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One-group transport theory calculation for three slabs cells, 7:31993 (IEA-DT—148)
Uranium dioxide sintering kinetics and mechanisms under controlled oxygen potentials, 7:32235 (IEA-DT—141)

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Comparative study of some methods for the determination of uranium used at the Instituto de Pesquisas Energeticas e Nucleares, 7:32193 (IPEN-Pub—17)
Experimental analysis of a nuclear reactor prestressed concrete pressure vessels model, 7:31983 (INIS-mf—6770)

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Determination of the uranium concentration in soil solutions by the fission track registration technique, 7:31780 (INIS-mf—6777)
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Chemistry of nitro complexes of nitrosylruthenium, 7:32194 (JAERI-M—9159)
Computational studies of tokamak plasmas, 7:32873 (JAERI-M—9354)
Detailed analysis of the dynamic behavior of the JT-60 vacuum vessel under the saddle-like electromagnetic forces, 7:32896 (JAERI-M—9242)
Experiment of long pulse beam injection into cryopump, 7:32895 (JAERI-M—9213)
Full-Scale Mark II CRT program data report No. 10 (TEST 1203), 7:32030 (JAERI-M—9403)
Full-Scale Mark II CRT program data report No. 11 (TEST 1204), 7:32031 (JAERI-M—9404)
Ionization cross sections for ion-atom and ion-molecule collisions, 1. Ionization cross sections for H^+, H_3^+, H_3^+, He^+ and He^{++} incident on H, H_2 and He, 7:32704 (JAERI-M—9310)
LFTPLT8: plotter program for RELAP5 code, 7:32029 (JAERI-M—9359)
One-dimensional transport code for the simulation of D-T burning tokamak plasma. POISE 1, 7:32872 (JAERI-M—9167)
Parallel computation for neutron diffusion equation, 7:31972 (JAERI-M—9235)
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Atlas of Wolf-Rayet line profiles, 7:32605 (JILA—117)

Joint Inst. for Nuclear Research, Dubna (USSR)
Statistical limits for the unfolding of closely overlapping peaks in the X-ray spectrum analysis, 7:32705 (JINR—E-7-12219)

Joint Inst. for Nuclear Research, Dubna (USSR). Dept. of New Acceleration Methods
Experimantal study on heat transfer in He-I and He-II for stationary thermal load, 7:32719 (JINR—8-80-536)
Light collection in large liquid scintillation counters with dacron foil wali, 7:32412 (JINR-R—13-81-74)

Joint Inst. for Nuclear Research, Dubna (USSR). Dept. of Radiation Safety
Dependence of LiF thermoluminescent detector response positioned behind different absorbers on energy of gamma radiation, 7:32414 (JINR-R—16-81-330)
International comparison of means for measurement of neutron spectra and radiation doses in the IBR-30 reactor beam, 7:32003 (JINR-R—16-80-448)

Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Computing Techniques and Automation
Compensation of nonlinear distortions in spiral reader, 7:32402 (JINR—10-80-831)
Control algorithms for scanning device AELT-2/160. Pt. 1, 7:32452 (JINR-R—10-81-83)

Directives of the SPS spectrum processing system, 7:31973 (JINR-R—10-80-861)
General organization of program generation system for film data processing, 7:32410 (JINR-R—10-81-316)
Organization of number sets input/output in the spectrum processing system, 7:32408 (JINR-R—10-81-56)
Program generation as a software maintenance in big program systems, 7:32409 (JINR-R—10-81-315)
SING-dialoque subsystem for graphical representation of one-dimensional array contents, 7:32917 (JINR-R—11-12133)

Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of High Energy

Elastic d-d small angle scattering at 4.6 GeV/c, 7:32725 (JINR—1-81-82)
Expansion device for a track-sensitive deuterium target, 7:32405 (JINR—13-80-808)
Hadron-nucleon inelastic collision mean free path in nuclear matter, 7:32777 (JINR—E-1-80-799)
Hadron-nucleus collisions. Pt. 1. Picture, description procedure, cross-sections, 7:32778 (JINR—E-1-81-154)
Pressurised position sensitive detector for gamma detection, 7:32413 (JINR-R—13-81-298)
Units for output of graphical information on display in the "Crystal" experiment, 7:32450 (JINR—1-81-29)

Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Neutron Physics

Intermediate structure in proton resonances, 7:32771 (JINR-R—15-80-786)
Magnetic field stabilization within the 1-10 mkT range by means of cesium quantum magnetometer, 7:32002 (JINR-R—13-12037)
Measuring module of spectrometer of neutron small angle scattering on the IBR pulse reactor, 7:32001 (JINR-R—10-80-826)
Method of parallel processing in SANPO real time system, 7:32916 (JINR-R—10-81-342)
Parameters of osmium neutron resonances in 6 - 60 eV range, 7:32783 (JINR-R—3-81-19)
Study on the (n, α) reactions on ^{147}Sm, ^{149}Sm, ^{143}Nd isotopes at 2 keV neutron energy using Sc filtered beam, 7:32779 (JINR-R—3-80-779)

Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Problems

Algorithm for electron fast track recongnition in C-detector of the ARES spectrometer, 7:32404 (JINR—11-81-300)
^{149}Dy beta decay and ^{149}Tb excited states, 7:32780 (JINR-R—6-81-23)
GFUN3D program for computerizing three-dimensional magntostatic fields, 7:32914 (JINR—9-81-304)
Numerical generation of orthomonic polynomials of many variables, 7:32915 (JINR—E-11-80-782)
Program package for data preparation of RISK events. Pt. 1. The description of program SMHV, 7:32406 (JINR—E-10-80-787)
"PROSPEC" computer program complex for automatic processing of multidimensional gamma-gamma coincidence spectra, 7:32403 (JINR—10-81-159)
Some peculiarities of the Vavilov-Cherenkov radiation connected with the finite thickness of the radiator, 7:32813 (JINR-R—14-80-793)
Study of hyperfine magnetic fields on the impurity of Sm in Fe and Ni ferromagnetic lattices, 7:32154 (JINR-R—14-81-177)
Study on the neutron yield from thick targets under the action of 645 MeV protons, 7:32766 (JINR—18-80-540)
Wide-aperture gas threshold Cherenkov counter, 7:32407 (JINR-R—1-81-30)

Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Reactions

Concentration of trace elements from Cheleken peninsula thermal brines by means of foam flotation, 7:32195 (JINR—6-81-75)
Duration of ^{238}U fission induced by ^{3}He, 7:32794 (JINR-R—15-80-762)
Experiments on the fusion of element 108 in the ^{226}Ra + ^{48}Ca reaction, 7:32792 (JINR-R—7-12054)
Methods of gold content determination in geological samples with the use of microtron resonance neutrons, 7:32196 (JINR—18-80-841)
Multi-channel amplitude analyzer on the basis of the MERA-60 microcomputer, 7:32451 (JINR—13-81-11)
Neutron detector for detecting rare events of spontaneous fission, 7:32411 (JINR-R—13-81-18)
Resonance scattering of 3-5 MeV γ-quanta emitted at radioactive decay, 7:32786 (JINR-R—15-81-151)
Spontaneous fission of heavy isotopes of nielsbohrium (Z=105) and element 106, 7:32793 (JINR-R—7-12056)
Study on the ^{48}Ca ion fusion with sup(203,205)Tl, sup(208)Pb and sup(209)Bi nuclei, 7:32790 (JINR-R—7-12061)

Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics

Cascade-exciton model of nuclear reactions. Model formulation, 7:32800 (JINR-R—2-80-774)
Collective two-phonon states in deformed nuclei, 7:32784 (JINR-R—4-81-148)
Fokker-Planck equation for the description of thermalization of beams of energetic charged particle channeled through a crystal, 7:32707 (JINR-R—17-80-814)
Possible effect of strong interaction on mesic molecule systems properties, 7:32706 (JINR-R—4-81-72)
Probability of E1-transition taking into account anharmonicity for ^{176}Hf in neutron binding energy range, 7:32785 (JINR-R—4-81-243)
Problem of neutron spectroscopy of parametrically nonequilibrium quasiparticles in solids. Pt. 1. Neutron inelastic scattering on polaritons in the parametric resonance conditions, 7:32812 (JINR—E-17-81-60)

Junta de Energia Nuclear, Madrid (Spain)

Version E2 from Dimco-System for the statistical calculation of components, 7:31984 (JEN—500)

K

Karlsruhe Univ. (TH) (Germany, F.R.)

Institute in 1978, 7:32911 (NP—2901108)

Karlsruhe Univ. (TH) (Germany, F.R.). Fakultaet fuer Maschinenbau

Contribution to the investigation of the STROUHAL number of high structures in natural wind for very high Reynolds numbers, 7:31901 (NP—2901105)

Kentucky Univ., Lexington (USA). Inst. for Mining and Minerals Research

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Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.). Inst. fuer Festkoerperforschung

Application of an efficient algorithm for the numerical Laplace inversion, 7:32918 (Juel—1672)

Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.). Inst. fuer Reaktorbauelemente

Experimental investigation about the kinetics of sulfur trioxide-splitting, 7:32212 (Juel—1669)

Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.). Inst. fuer Reaktorentwicklung

Sound monitoring for detection of pipe ruptures, 7:32283 (Juel-Spez—88)

Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Abt. fuer Angewandte Systemanalyse

Interim storage requirements for spent LWR fuel elements for alternative scenarios of an increased use of nuclear energy in the Federal Republic of Germany, 7:31791 (KFK—3084)

Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Inst. fuer Angewandte Kernphysik 2

Isotope shifts in unstable nuclei, 7:32781 (KFK—2974)
Progress report of the Teilinstitut Nukleare Festkoerperphysik of the Institut fuer Angewandte Kernphysik from June 1st, 1979 to May 31st, 1980, 7:32764 (KFK—3051)

Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Inst. fuer Material- und Festkoerperforschung

Investigations on swelling of U-PU mixed carbide, 7:32173 (KFK—3078)

Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Inst. fuer Neutronenphysik und Reaktortechnik

DIAMANT 2: a multigroup neutron-transport program for triangular and hexagonal geometry, 7:31975 (ORNL-tr—4797)
Heat transfer and pressure drop at single pins with three-dimensional roughnesses, 7:32275 (KFK—3165)
Heat transfer and pressure drop at single rods with three-dimensional roughnesses. Large scale tests, 7:32274 (KFK—3164)

Measurements of density and of thermal expansion coefficient of sodium tetraborate (borax)-UO_2 and of sodium metaborate-UO_2 solutions, 7:32174 (KFK—3088)
Velocity and temperature profiles in rough annuli, 7:32273 (KFK—3163)

Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Inst. fuer Reaktorbauelemente
Numerical investigation of natural convection in a Hele-Shaw gap heated from below, 7:32272 (KFK—3142)
Steady-state, local temperature fields with turbulent sodium flow in nominal and disturbed bundle geometries with spacer grids, 7:31947 (KFK—2856)

Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Inst. fuer Reaktorentwicklung
Variants of ICE-technique with reduction of numerical damping, 7:32720 (KFK—3170)

Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Projekt Nukleare Sicherheit
Variants of ICE-technique with reduction of numerical damping, 7:32720 (KFK—3170)

Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Projekt Schneller Brueter
Investigations on swelling of U-PU mixed carbide, 7:32173 (KFK—3078)
Measurements of density and of thermal expansion coefficient of sodium tetraborate (borax)-UO_2 and of sodium metaborate-UO_2 solutions, 7:32174 (KFK—3088)
Steady-state, local temperature fields with turbulent sodium flow in nominal and disturbed bundle geometries with spacer grids, 7:31947 (KFK—2856)

Korea Advanced Energy Research Inst., Seoul (Republic of Korea)
Analysis for post irradiation examination: pt. 1, 7:31995 (KAERI/RR—247/80)
Apparatus for the isotope separation, 7:31786 (KAERI/RR—256/80)
Core management and performance analysis for PWR, 7:31924 (KAERI/RR—225/80)
Development of chemical analysis techniques, 7:32197 (KAERI/RR—210/80)
Development of fracture mechanics and related techniques for evaluation of flaws detected during inservice inspection. Part 3, 7:31985 (KAERI/RR—221/80)
Development of nondestructive testing technique. Ultrasonic testing and radiographic testing, 7:32453 (KAERI/RR—262/80)
Development of portable survey meter, 7:32415 (KAERI/RR—218/80)
Dynamics study of AUC precipitation. Studies on the reconversion of UF_6, 7:32236 (KAERI/RR—241/80)
Establishing QC/QA system in the fabrication of nuclear fuel assemblies, 7:31994 (KAERI/RR—245/80)
Experimental study of safety injection and reflooding, 7:32032 (KAERI/RR—231/80)
Experiments and analysis of thermal stresses around the nozzle of the reactor vessel, 7:31922 (KAERI/RR—222/80)
Fabrication of PWR fuel assembly and CANDU fuel bundle, 7:31926 (KAERI/RR—243/80)
Improvement of failed fuel detection system of light water reactor, 7:31925 (KAERI/RR—226/80)
Manufacturing of laboratory equipments, 7:31940 (KAERI/RR—238/80)
Manufacturing process of UO_2 pellets, 7:31939 (KAERI/RR—236/80)
Nuclear design and analysis for PWR, 7:31923 (KAERI/RR—223/80)
Nuclear fuel design. Design and fabrication of a CANDU-600 fuel 3-element bundle for an irradiation test, 7:31941 (KAERI/RR—242/80)
Study for standardization of nuclear power plant control panels, 7:31997 (KAERI/RR—224/80)
Study of material science by neutron scattering, 7:32814 (KAERI/RR—267/80)
Study on the neutron activation analysis, 7:32199 (KAERI/RR—272/80)
Study on the radioisotope-identification, 7:32198 (KAERI/RR—244/80)
Survey of nuclear fusion technology. A prospect analysis of tokamak fusion research, 7:32897 (KAERI/RR—275/80)
Update and benchmark test of the LEOPARD library from ENDF/B-IV, 7:31974 (KAERI/RR—201/80)

Kraftwerk Union A.G., Berlin (Germany, F.R.)
Possibilities and limits of oil substitution, 7:32088 (NP—2901053)

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Research report on fuel failure in Mihama Unit 1 nuclear power plant, 7:31927 (KURRI-TR—197)

L

Lawrence Berkeley Lab., CA (USA)
Development and use of a hemispherical sky simulator, 7:32112 (LBL—13400)
Enzymatic hydrolysis of cellulose: theory and applications, 7:31829 (LBL—13669)
Influences of gaseous environment on low-growth-rate fatigue-crack propagation in steels. Final report, 7:32142 (DOE/ER/10389—2)
Optical absorption spectroscopy of molecules adsorbed on Ni(111) and energy transfer from the ^{3}eta π^* state of pyrazine to Ni(111) and Ag(111) surfaces, 7:32156 (LBL—13623)
Review of meson spectroscopy: quark states and glueballs, 7:32709 (LBL—13593)

Lawrence Livermore National Lab., CA (USA)
Air-quality-model update, 7:32481 (UCID—19300)
Applying structured analysis in a real-time data acquisition environment, 7:32928 (UCRL—86341)
Chemical properties of the heavier actinides and transactinides, 7:32237 (UCRL—85944)
Coatings for laser fusion, 7:32903 (UCRL—87037)
Elastomechanical methods in the exploration of the Valles Caldera, New Mexico. Final report, June 8, 1981-October 8, 1981, 7:31882 (UCRL—15423)
EPROM-based LSI-11 for distributed instrumentation control, 7:32929 (UCRL—86500)
High energy laser facilities at Lawrence Livermore National Laboratory, 7:32904 (UCRL—87038)
Magnetron co-sputtering system for coating ICF targets, 7:31822 (UCRL—86160)
Motion control system for the Large Optics Diamond Turning Machine (LODTM), 7:32254 (UCRL—86438)
Solvent extraction of methane from simulated geopressured-geothermal fluids: sub-pilot test results, 7:31896 (UCID—19291)
State of work on the AMBAL experiment, 7:32902 (UCID—19206)
Studies of the nuclear equation of state using numerical calculations of nuclear drops collisions, 7:32606 (UCRL—86964)
TAAMM submunition project. Monthly progress report No. 8, July 1-31, 1979, 7:32469 (UCID—18253)
TRANSF code user manual, 7:32927 (UCID—19268)
User facilities at the Lawrence Berkeley Laboratory, 7:32354 (LBL-PUB—426)
WIDCO mine coal face in-situ gasification test, 7:31720 (UCID—19280)

Los Alamos National Lab., NM (USA)
Calculated neutron-source spectra from selected irradiated PWR fuel assemblies, 7:31928 (LA—9125-MS)
Decommissioning the Los Alamos Molten Plutonium Reactor Experiment (LAMPRE I), 7:31955 (LA—9052-MS)
E2 isovector giant resonance as seen through the capture of fast neutrons, 7:32795 (LA—9026)
Impact of flywheel-energy-storage technology upon taxicab fleet operation in a large metropolitan city, 7:32130 (LA-UR—81-3071)
Mechanical design of RFQ resonator cavities in the 400-MHz frequency range, 7:32325 (LA-UR—81-3057)
Network file-storage system, 7:32919 (LA-UR—81-3558)
Neutron measurement techniques for the nondestructive analysis of irradiated fuel assemblies, 7:31820 (LA—9002-MS)
Nuclear safeguards research and development. Program status report, October 1980-January 1981, 7:31819 (LA—8870-PR)
Numerical prediction of subsidence with coupled geomechanical-hydrological modeling, 7:32594 (LA-UR—81-3700)
Octupole focusing in transport and acceleration systems, 7:32326 (LA-UR—81-3058)

Passive solar retrofit study for the United States Navy, 7:31869 (LA—9071-MS)
Polarons in polyacetylene, 7:32836 (LA-UR—81-3590)
Polyacetylene: a real material linking condensed matter and field theory, 7:32754 (LA-UR—81-3636)
Reduction of photosynthetically active radiation under extreme stratospheric-aerosol loads, 7:32474 (LA-UR—81-3573)
Research and development related to the Nevada Nuclear Waste Storage Investigations. Progress report, April 1-June 30, 1981, 7:31795 (LA—8959-PR)
Solar-absorber-selective paint research, 7:31879 (LA-UR—81-3610)
Sunlight activation of shale-oil byproducts as measured by genotoxic effects in cultured Chinese hamster cells, 7:32587 (LA-UR—81-3204)
Synthesis of hydrocarbons in the earth's crust, 7:31750 (LA—8983)
Trace element characterization of coal wastes. Fifth annual progress report, October 1, 1979-September 30, 1980, 7:31728 (LA—8826-PR)
Vacancy behavior in a compressed fcc Lennard-Jones crystal, 7:32835 (LA—9121-MS)
VNAP2: a computer program for computation of two-dimensional, time-dependent, compressible, turbulent flow, 7:32276 (LA—8872)

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M

Maine Office of Energy Resources, Augusta (USA)
Comprehensive Energy Plan, 7:32093 (NP—2901890)

Mainz Univ. (Germany, F.R.). Fachbereich Physik
Elastic scattering of monochromatic photons at the atomic nucleus of ^{208}Pb in and above the dipole giant resonance, 7:32789 (INIS-mf—6825)

Massachusetts Inst. of Tech., Cambridge (USA)
Application of high-strength copper alloys for a fusion-reactor first wall, 7:32141 (DOE/ER/10107—9)
Development of a miniaturized disk-bend test for the determination of postirradiation mechanical properties, 7:32885 (DOE/ER/10107—12)
Failure criteria for fusion-reactor first-wall structural design, 7:32883 (DOE/ER/10107—10)
Mechanical properties and structure of rapidly solidified high-titanium-stabilized 316 stainless steel, 7:32139 (DOE/ER/10107—5)
Microstructure of neutron irradiated rapidly solidified Path A Prime-Candidate Alloys, 7:32881 (DOE/ER/10107—6)
Microstructure of rapidly solidified Al_2O_3-dispersion-strengthened Type 316 stainless steel, 7:32137 (DOE/ER/10107—3)
Microstructure of rapidly solidified Path A Prime-Candidate Alloys, 7:32882 (DOE/ER/10107—8)
Microstructure of rapidly solidified Path A prime-candidate alloys following irradiation with Fe and He ions, 7:32140 (DOE/ER/10107—7)
Pre-irradiation spatial distribution and stability of boride particles in rapidly solidified boron-doped stainless steels, 7:32138 (DOE/ER/10107—4)
Recoil resolution and particle stability under irradiation, 7:32884 (DOE/ER/10107—11)
Reduction of carbon monoxide. Past research summary, 7:32215 (DOE/ER/04949—1)

Massachusetts Inst. of Tech., Cambridge (USA). Dept. of Mechanical Engineering
Influences of gaseous environment on low-growth-rate fatigue-crack propagation in steels. Final report, 7:32142 (DOE/ER/10389—2)

Massachusetts Inst. of Tech., Cambridge (USA). Dept. of Nuclear Engineering
Coastdown in light water reactors as a fuel management strategy, 7:31920 (INIS-mf—6753)

Massachusetts Inst. of Tech., Cambridge (USA). Plasma Fusion Center
Comparative study of fundamental and second-harmonic ICRF wave propagation and damping at high density in the Alcator tokamak, 7:32848 (DOE/ET/51013—27)

Massachusetts Inst. of Tech., Lexington (USA). Lincoln Lab.
Application, sizing, testing and performance of the photovoltaic battery subsystem at Natural Bridges National Monument, Utah, 7:31855 (DOE/ET/20279—153)

Massachusetts Inst. of Tech., Oak Ridge, TN (USA). School of Chemical Engineering Practice
Preparation and characterization of β-D-glucosidase immobilized in calcium alginate, 7:31848 (ORNL/MIT—336)
Study of droplet formation for preparation of spheres by internal gelation, 7:31799 (ORNL/MIT—337)

Mathtech, Inc., Princeton, NJ (USA)
Cross-ridge mountaintop mining. Subphase III-X. Technical progress report, June 1, 1979-January 31, 1980, 7:31732 (DOE/ET/13354—T1)

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Experimental investigation of linear mode conversion in laser-produced plasmas, 7:32876 (PLF—39)
Time-resolved uv spectroscopy on ammonia excited by a pulsed CO_2 laser, 7:32710 (PLF—31)

Max-Planck-Institut fuer Plasmaphysik, Garching (Germany, F.R.)
Pellet production methods for fueling fusion devices, 7:31821 (IPP—4/188)
Theory of the M = 1 mode in high temperature plasmas, 7:32856 (IPP—6-201)

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Nucleon-nucleon theory and phenomenology. Progress report and renewal proposal, 7:32723 (DOE/ER/10516—10)

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Energy education programs, 7:32125 (DOE/IR/10905—20)

Mineraloelwirtschaftsverband e.V., Hamburg (Germany, F.R.)
Mineral oil and employment. Jobs in the West German mineral oil industry and its secondary industries, 7:31753 (NP—2901054)

Ministerstvo Vysshego i Srednego Spetsial'nogo Obrazovaniya SSSR, Moscow
Accelerators. Issue 17, 7:32314 (INIS-SU—67)

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Energy education programs, 7:32125 (DOE/IR/10905—20)

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Contribution of electronically excited states to the radiation chemistry of organic systems. Progress report, September 1, 1980-November 30, 1981, 7:32221 (DOE/ER/00913—2)
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Studies in chemical reactivity. Progress report, November 30, 1980-1 December 1981, 7:32222 (DOE/ER/02026—41)

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Accelerators. Issue 17, 7:32314 (INIS-SU—67)
Problems on dosimetry and radiation protection. No. 19, 7:32822 (INIS-SU—39)

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Mass balance results for the Pricetown I underground coal gasification field test, 7:31718 (MLM-MU—81-72-0002)
Mound cyclone incinerator. Volume I. Description and performance, 7:31796 (MLM-MU—81-72-0003-Vol.1)
Mound Facility activities in chemical and physical research: January-June 1981, 7:31825 (MLM—2884)

N

Nagoya Univ. (Japan). Inst. of Plasma Physics
Anomalous viscosity due to weak turbulence in imploding target plasma, 7:32892 (IPPJ—473)
Computer simulation on microinstabilities and anomalous resistivity near the magnetic neutral sheet, 7:32869 (IPPJ—487)

Cross sections for charge transfer collisions involving hydrogen atoms, 7:32703 (IPPJ-AM—15)
Feedback controller of ultra high pressure gas, 7:32870 (IPPJ-DT—82)
Mechanism for ion heating by lower hybrid waves, 7:32860 (IPPJ—476)
Mixing length hypothesis in the dissipative trapped ion instability, 7:32864 (IPPJ—481)
New series of integrable nonlinear evolution equations, 7:32866 (IPPJ—484)
Numerical simulation of density evolution in JIPP T-2 tokamak, 7:32865 (IPPJ—483)
Numerical study of explosive tearing mode instability in one-component plasmas, 7:32868 (IPPJ—486)
Oblique collision of plane ion-acoustic solitons, 7:32859 (IPPJ—475)
Proceedings of the Nagoya seminar on atomic processes in fusion plasmas, 7:32702 (IPPJ-AM—13)
Proceedings of USSR-Japan joint seminar on plasma diagnostics Nov. 13, 1979 through Nov. 17, 1979, 7:32857 (IPPJ—438)
Relation between Weibel instability and magnetic field generating thermal instability, 7:32867 (IPPJ—485)
Relaxed condition for purely ohmic ignition in reversed field pinch configurations, 7:32891 (IPPJ—472)
Simulation of plasma confinement in RF plugged cusp field, 7:32861 (IPPJ—477)
Spinning plasma ring stable to tilting mode, 7:32862 (IPPJ—478)
Tearing modes in a current sheet with weak normal magnetic field, 7:32858 (IPPJ—474)
Two dimensional behavior of solitons in a low-β plasma with convective motion, 7:32863 (IPPJ—480)

National Academy of Sciences, Washington, DC (USA). Board on Science and Technology for International Development
Workshop on ethanol as an alternative source of fuels, 7:31845 (NP—2902045)

National Aeronautics and Space Administration, Cleveland, OH (USA). Lewis Research Center
Small passenger car transmission test: Chevrolet Malibu 200C transmission with lockup, 7:32131 (DOE/NASA/0124—6)
Summary and evaluation of the conceptual design study of a potential early commercial MHD power plant (CSPEC), 7:32109 (DOE/NASA/10769—21)
Variable gain for a wind turbine pitch control, 7:31898 (DOE/NASA/20320—34)

National Aeronautics and Space Administration, Washington, DC (USA)
Cryogenic-container suspension strap: a supporting strap has low thermal conductivity. NTIS Tech Note, 7:32253 (PB—81-970073)
Multiplexed logic controls solar-heating system: inexpensive sensors and logic circuits select from four operating modes. NTIS Tech Note, 7:31871 (PB—81-971025)

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Radioimmunoassay data processing (BASRIA). Software, 7:32548 (PB—82-121971)
Radioimmunoassay data processing (RIAPROG) - 4th edition. Software, 7:32547 (PB—82-121955)

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Environmental surveillance plan for the Department of Energy's Niagara Falls Storage Site (NFSS), Lewiston, New York, 7:31797 (NLCO—008EV)

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Statistical aspects of the interpretation of counting experiments designed to detect low levels of radioactivity, 7:32418 (NRPB-R—113)

Nauchno-Issledovatel'skij Inst. Atomnykh Reaktorov, Dimitrovgrad (USSR)
Programmable α-spectrometer for radiochemical studies, 7:32417 (NIIAR—41(449))
Technological testing of a district heating benchmark at the VK-50 reactor, 7:31958 (NIIAR—15(468))

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Generation of tubular beams of negative hydrogen ions by a surface plasma source, 7:32899 (NIIEFA-P-K—0488)
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Assessment of synfuel spill cleanup options, 7:31730 (PNL-SA—9806)
Chemical/biological characterization of SRC-II product and by-products, 7:31747 (PNL-SA—8813)
Cost of heat from a seasonal source, 7:32067 (PNL-SA—9891)
Dependence of vertical wind shear fluctuations on averaging times, 7:32475 (PNL-SA—8705)
Design and environmental applications of an ultra-low-background, high-efficiency intrinsic Ge gamma-ray spectrometer, 7:32200 (PNL-SA—8945)
Effect of organic complexants on the mobility of low level waste radionuclides in soils, 7:31805 (PNL-SA—10019)
Environmental effects of reactor waste disposal alternatives, 7:31801 (PNL-SA—8604)
Evaporation of in-situ oil-shale-retort water, 7:31776 (PNL-SA—9805)
Flow and fracture in the fusion environment, 7:32158 (PNL-SA—9759)
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Liquid-waste immobilization by agglomeration, 7:31804 (PNL-SA—9739)
Pacific Northwest biomass as an energy resource, 7:31850 (PNL-SA—9982)
Package receipt assay systems, 7:31792 (PNL-SA—10022)
Radical pathways of coal dissolution in donor media during reactions of coals and specifically deuterated tetralin, 7:31719 (PNL-SA—9020)
Review of multibarrier waste from development, 7:31803 (PNL-SA—9440)
Service-interruption reporting, 7:32921 (PNL-SA—9984)
Simplified evacuation model for estimating mitigation of early population exposures, 7:32572 (PNL-SA—9133)
Solid phases limiting the concentration of dissolved constituents in basalt aquifers of the Columbia Plateau in eastern Washington, 7:32602 (PNL-SA—9848)
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Use of controlled release herbicides in waste burial sites, 7:31818 (PNL-SA—9503)
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Correction factor for hair analysis by PIXE, 7:32201 (PUC-tn—14/79)
Effects of X-ray absorption in the analysis of thick target samples by XRF, 7:32202 (PUC-tn—22/80)
Percolation with first-and-second neighbour bonds: a renormalization-group calculation of critical exponents, 7:32837 (PUC-tn—05/80)
Remarks on the percolation problem in anisotropic systems, 7:32839 (PUC-tn—18/79)
Transfer matrix treatment for linear chains with long range interactions, 7:32838 (PUC-tn—17/80)
Transfer matrix treatment of atomic chemisorption on transition metal surface, 7:32159 (PUC-tn—07/80)
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Electromagnetic mass separator for heavy element radioisotope separation, 7:31787 (RI—136)
Target sputtering by multicharged heavy ion beams, 7:32711 (RI—120)
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Radionuclide ground-water monitoring program for the separations area, Hanford Site, Washington State, 7:32534 (RHO-SA—216)
Results of the separations area ground-water monitoring network for 1980, 7:31807 (RHO-LD—165)
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Nonlinear theory of elastic shells, 7:32250 (INIS-mf—6729)
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Charge-exchange Gamow-Teller and dipole resonances in ^{90}Zr, 7:32773 (IFUSP-P—225)
Collective motion and the generator coordinate method, 7:32796 (IFUSP-P—206)
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Energy splitting between the $T=T_0$ and $T=T_0-1$ components of the charge-exchange vector dipole resonance, 7:32774 (IFUSP-P—246)
Equations of motion for nuclear particle-particle excitations and the interacting boson model, 7:32788 (IFUSP-P—245)
Interacting sp-boson model with isospin: an unified description of giant multipole resonances and other collective motions, 7:32797 (IFUSP-P—240)
Ising model with competing axial interactions in the presence of a field, 7:32834 (IFUSP-P—239)
Low angular-momentum-cutoff in statistical heavy-ion processes, 7:32768 (IFUSP-P—244)
Modified version of the Monte Carlo computer code for calculating neutron detection efficiencies, 7:32391 (IFUSP-P—250)
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Electrochemical cell for measuring oxygen activity in liquid sodium, 7:31945 (FEI—1061)

Zentralverband der Elektrotechnischen Industrie e.V. (ZVEI), Frankfurt am Main (Germany, F.R.)
Statistics report '80, 7:32100 (NP—2901048)

PERSONAL AUTHOR INDEX

Authors' surnames are indexed in the form appearing in the abstracted publication; given names are reduced to initials. Each author entry gives the publication title and the citation number. Report numbers, if applicable, are given in parentheses at the end of the entry. For publications with multiple authors, an author entry is provided for each. Entries for the second and succeeding authors give references to the first author.

Because of problems involved in the mechanical preparation of this index, all accent marks are omitted. Changes in spelling introduced as a result of accent omission follow standard conventions.

A

Aaron, D.B., *See* Guo, K.J., 7:31887

Abbott, D.H., *See* Vukovich, F.M., 7:31897

Abdrashitov, S.F., Phenomenological characteristics of the muon and electron components of extensive air showers with sizes 10^6-10^7 at mountain altitude, 7:32661

Abdulakhatov, M.K., Electromagnetic mass separator for heavy element radioisotope separation, 7:31787 (RI—136)

Abdullah, M.M., Study of the age parameter of extensive air showers observed at sea level, 7:32659

Abdurakhimov, A.U., Compensation of nonlinear distortions in spiral reader, 7:32402 (JINR—10-80-831)

Abe, H., Mechanism for ion heating by lower hybrid waves, 7:32860 (IPPJ—476)

Abe, N., *See* Yamano, K., 7:32029

Abe, T., Anomalous viscosity due to weak turbulence in imploding target plasma, 7:32892 (IPPJ—473)

Abel, J.A., *See* Szedon, J.R., 7:31851

Abrams, G.S., *See* Roussarie, A., 7:32732

Abuaf, N., *See* Saha, P., 7:32045

Acquadro, J.C., Contribution of quasi-elastic processes to the total reaction cross-section of heavy ions, 7:32769 (IFUSP-P—249)

Adam, W.E., *See* Loos, U., 7:32561

Adams, J.H. Jr., Analytic model for the differential energy spectra of cosmic rays, 7:32609

Adamyan, F.V., Program controlled system for measuring and monitoring the electron coherent radiation spectrum of Yerevan synchrotron, 7:32370 (EFI—398(5)-80)

Adegbulugbe, A.O., Failure criteria for fusion-reactor first-wall structural design, 7:32883 (DOE/ER/10107—10)

Adkins, C.R., Double-wall tube steam generator for breeder nuclear plants, 7:31950

Adlercreutz, H., *See* Kairento, A.L., 7:32556

Agarwal, A.K., Mass balance results for the Pricetown I underground coal gasification field test, 7:31718 (MLM-MU—81-72-0002)

Ageev, A.I., *See* Arkharov, A.M., 7:32719

Agron, P.A., *See* Carlson, T.A., 7:32713

Aguilar-Benitez, M., European hybrid spectrometer. Part D: hadron calorimeters, 7:32395 (IFVE-OEIPK—80-143)

Ahn, H.S., *See* Lee, Y.P., 7:32453

Ahrens, J., *See* Kaspar, K., 7:32342

Akatsu, E., Chemistry of nitro complexes of nitrosylruthenium, 7:32194 (JAERI-M—9159)

Akiyama, M., *See* Ihara, H., 7:32776

Akopov, G.A., *See* Abdulakhatov, M.K., 7:31787

Alam, M.S., *See* Roussarie, A., 7:32732

Alavi, A., *See* Reivich, M., 7:32540

Alberi, J.L., Data acquisition and experiment control system for high-data-rate experiments at the National Synchrotron Light Source, 7:32327 (BNL—30337)

Albrecht, D., *See* Fischer, B.E., 7:32302

Albrecht, R., Experimental electronics group (Elektronik/Experimente), 7:32378 (GSI—81-2, pp 215)

See Geissel, H., 7:32808

Aleinikov, V.E., International comparison of means for measurement of neutron spectra and radiation doses in the IBR-30 reactor beam, 7:32003 (JINR-R—16-80-448)

Aliev, N.A., *See* Khristiansen, G.B., 7:32638

Aliev, S.A., *See* Khristiansen, G.B., 7:32637

Alimov, N.N., *See* Khristiansen, G.B., 7:32637

Alimov, T.A., *See* Khristiansen, G.B., 7:32638

Allen, C.A., Chemical logging of geothermal wells, 7:31891

Allen, F.B., *See* Kent, S.P., 7:32543

Allen, P.A., Bibliography of reports by the Sandia photovoltaic projects, 7:31858 (SAND—81-0135-Rev.1)

Allkofer, O.C., Ultra high energy primary composition and interaction studies with Dumand, 7:32431

Almanza, R., Solar concentrators, 7:31880 (PB—82-157553)

Alonso, C.T., Studies of the nuclear equation of state using numerical calculations of nuclear drops collisions, 7:32606 (UCRL—86964)

Amano, T., *See* Shimizu, K., 7:32865

Amatuni, A.T., Soliton excitation in a nonisothermal electron-ion plasma by electron bunch with given parameters, 7:32849 (EFI—442(49)-80)

Amemiya, Y., *See* Ando, M., 7:32352

Amneus, H., *See* Zipfel, P.F., 7:32546

Amri, A., Use of the biomass of black pine (Pinus nigra arn.) and locust (Robinia Pseudoacacia L.) as raw material for chip boards in consideration of whole-tree harvesting, 7:31842 (NP—2901104)

Andam, A.A., Cascade development of cosmic ray showers, 7:32628

Cosmic ray showers imaged in Cerenkov light, 7:32650

Shape of Cerenkov light pulses as a measure of cascade development in large air showers, 7:32649

Andersen, P.S., Basic theoretical calculations of wind turbines, 7:31900 (Riso-M—2153)

Anderson, A.L., In vivo measurement of actinides in the human lung, 7:32579

See Campbell, G.W., 7:32823

Anderson, C.A., *See* Girrens, S.P., 7:32594

Anderson, D.R., Combined effects of nickel, chlorine, and temperature on the mortality of rainbow trout, Salmo gairdneri, 7:32589

Anderson, E.C., *See* Thomas, R.G., 7:32573

Anderson, M.J., *See* Wagner, S.E., 7:32062

Anderson, R.T., Electro-mechanical snubber proposal, 7:31987

Ando, M., Proceedings of the plan meetings on x-ray instrumentation for the photon factory, Tsukuba, March to September, 1979, 7:32352 (KEK—79-34)

Andrews, J., Oceanographic studies for Dumand, 7:32430

Andrews, L., *See* Lempicki, A., 7:31877

Andrzejewski, J., Study on the (n, α) reactions on ^{147}Sm, ^{149}Sm, ^{143}Nd isotopes at 2 keV neutron energy using Sc filtered beam, 7:32779 (JINR-R—3-80-779)

Angert, N., Unilac operation, 7:32315 (GSI—81-2, pp 236)

See Klabunde, J., 7:32319

Aniol, K., *See* Drake, D.M., 7:32795

Anokhin, Yu.P., *See* Pevtsov, V.V., 7:32417

Anson, D., Potential for use of peat blends with coal for electric power generation, 7:31743

Anthony, R.G., *See* Fajula, F., 7:31830

Anti, M., *See* Galli, G., 7:32555

Antoniewicz, P.R., Interface hydrodynamic plasmon solutions of the Boltzmann equation, 7:32829 (DOE/ER/10890—1)

Antonov, S.N., *See* Pavlenko, V.I., 7:32537

Aoki, T., Characteristics of electronics components under high pressure, 7:32429

Aoki, Y., *See* Kunori, S., 7:32782

See Toba, Y., 7:32791
Argon, A.S., *See* Manahan, M.P., 7:32885
Arikawa, T., *See* Kaneko, Y., 7:32703
Arinobu, M., Multi-vent effects on the dynamic pressure caused by chugging, 7:32024 (GKSS—81/E/27, pp II 25-34)
Arkharov, A.M., Experimantal study on heat transfer in He-I and He-II for stationary thermal load, 7:32719 (JINR—8-80-536)
Arkhipov, V.A., *See* Aleinikov, V.E., 7:32003
Arlt, U., Detector development for the 5 m time-of-flight spectrometer, 7:32387 (GSI—81-2, pp 200)
Development and calibration of NE 213 neutron detectors with pulse shape discrimination, 7:32388 (GSI—81-2, pp 201)
Armelin, M.J.A., *See* Vasconcellos, M.B.A., 7:32193
Armitage, R., Comparison of muon rise-times and muon/electron density ratios with model calculations, 7:32621
Muon densities and muon/electron ratios in EAS, 7:32616
Arnberg, L., Microstructure of rapidly solidified Path A prime-candidate alloys following irradiation with Fe and He ions, 7:32140 (DOE/ER/10107—7)
Microstructure of neutron irradiated rapidly solidified Path A Prime-Candidate Alloys, 7:32881 (DOE/ER/10107—6)
See Kanani, N., 7:32138
See Megusar, J., 7:32137, 7:32882
See Testart, E., 7:32139
Arnold, K., *See* Klose, G., 7:32843
Arustamyan, G.V., Simulation of neutron detection process in modular detectors, 7:32371 (EFI—401(8)-80)
Asakimori, K., Energy flow of extensive air showers, 7:32677
Ash, A.G., Simulations of the longitudinal development and lateral distribution of electrons in extensive air showers, 7:32675
See Hazen, W.E., 7:32672
Ashton, F., Size dependence of the average transverse momentum of hadrons with respect to the shower axis direction in extensive air showers observed at sea level, 7:32671
See Abdullah, M.M., 7:32659
Asselineau, L., *See* Rojey, A., 7:32118
Atwood, C.L., Tests of a simple multinomial hypothesis when the sample is not large, 7:32845 (CONF-810842—3)
Atzmony, U., *See* Mintz, M.H., 7:32700
Au-Yang, M.K., Fluid-structure interaction--a survey with emphasis on its application to nuclear steam system design, 7:31932
Interactive fluid-structural dynamic problems in power engineering, presented at the joint conference of the pressure vessels and piping, materials, nuclear engineering, solar energy divisions, 1981, 7:32052
Normal modes of a coupled fluid-shell system, 7:31933
Aust, E., Review of GKSS 3-vent experimental program and results, 7:32022 (GKSS—81/E/27, pp I 81-125)
Avdeev, N.F., Xenon bubble chamber image processing on the POISK installation in the man-machine dialog regime, 7:32400 (ITEF—168(1980))

B

Babu, S.P., Development of a pressurized biomass gasification process, 7:31835 (CONF-810865—10)
Bach, P.W., FIM-atom probe investigation of the bainite transformation in CrMo steel, 7:32151 (INIS-mf—6830)
Bacher, R., *See* Suryoutomo, H., 7:32065
Backe, H., *See* Kankeleit, E., 7:32384
Badalyan, S.G., General organization of program generation system for film data processing, 7:32410 (JINR-R—10-81-316)
Baden, A., Plastic wall scintillator detector array, 7:32383 (GSI—81-2, pp 192)
Baer, M., *See* Jellinek, J., 7:32698
Bagdasarian, S., *See* Khristiansen, G.B., 7:32638
Bai, G., *See* Liu, Z., 7:32435
Baird, Q.L., Operational safety at the FFTF, 7:32036
Baisden, P.A., *See* David, F., 7:32243
Baker, S.M., *See* Baird, Q.L., 7:32036
Baklanov, S.G., *See* Shmelev, V.E., 7:31958
Bakov, A.T., On-line system for study of the physical performances of the BFS critical assemblies on the M-6000 computer basis, 7:31999 (FEI—1022)
Baldas, J., Quality assurance of radiopharmaceuticals-specifications and test procedures, 7:32229 (ARL/TR—034)
Bamblevskii, V.P., *See* Aleinikov, V.E., 7:32003
Bangert, U., *See* Thiel, K., 7:32181
Baptista, G.B., Analysis of trace elements in human hair by PIXE, 7:32203 (PUC-tn—24/80)
Effects of X-ray absorption in the analysis of thick target samples by XRF, 7:32202 (PUC-tn—22/80)
See Montenegro, E.C., 7:32201
Bar-Ziv, E., *See* Glatt, I., 7:32699
Baram, A., *See* Rosenfeld, Y., 7:32832
Baranchuk, M.K., Control algorithms for scanning device AELT-2/160. Pt. 1, 7:32452 (JINR-R—10-81-83)
Baranov, I.A., Target sputtering by multicharged heavy ion beams, 7:32711 (RI—120)
Baranov, V.A., Algorithm for electron fast track recongnition in C-detector of the ARES spectrometer, 7:32404 (JINR—11-81-300)
Barcinski, M., *See* Cullen, T.L., 7:32521
Barish, B.C., Recent results on total neutrino and antineutrino cross sections by the CFRR collaboration, 7:32730 (SLAC—245, pp 641-661)
See Rapidis, P.A., 7:32724
Barker, C.J., Administrative practices to limit dose in environmental cleanup operations involving plutonium, 7:32505 (CONF-8110125—1)
Barkman, W.E., Upgrading a production machine tool for precision machining, 7:32255 (Y—2264)
Barnaulova, T.V., Teleradiometer for remote atmospheric sensing in near infrared spectr spectral region, 7:32398 (INIS-SU—60)
Barnes, K.A., *See* Powell, J.W., 7:31833
Barnes, R.W., *See* Reister, D.B., 7:32091
Barnes, Z.K., *See* Caton, J.E., 7:32530
Barnthouse, L.W., *See* Boreman, J., 7:32526
Barros Leite, C.V. de, *See* Baptista, G.B., 7:32203
Bartlett, H.D., *See* Persson, S.P.E., 7:31844
Barylov, V.G., *See* Avdeev, N.F., 7:32400
Basak, D.K., *See* Ghoshdastidar, M.R., 7:32751
Baskes, M.I., Hydrogen recycling from stainless steel, 7:32905
See Bohdansky, J., 7:32167
Bass, R., *See* Arlt, U., 7:32387
Bastasz, R., Hydrogen ion impact desorption of sulfur from stainless steel, 7:32166
Batchelder, H.M., Solid Waste Information Management System (SWIMS). Data summary, Fiscal Year 1980, 7:31794 (DOE/TIC—2005250)
Bateman, J.E., High resolution, high counting rate bidimensional, MWPC imaging detector for small angle X-ray diffraction studies, 7:32421 (RL—81-053)
Bates, J.M., *See* Khan, E.U., 7:31948
Bau, R., *See* Zhuang, J., 7:32176
Bauman, T.J., *See* Heard, F.E., 7:31890
Baumann, H., Equipment for producing, investigating and testing carbon foils with high hydrogen contents, 7:32180 (GSI—81-2, pp 185)
Bayatyan, G.L., Angular distribution of bremsstrahlung γ-quanta, 7:32805 (EFI—421(28)-80)
Bayhurst, B.P., *See* Vine, E.N., 7:32523
Bayukov, Yu.D., Neutron spectra measuring by magnetless hadron spectrometer, 7:32399 (ITEF—159(1980))
Bazilevskaya, G.A., *See* Khristiansen, G.B., 7:32656
Beasom, J.D., 300° quad operational amplifier, 7:32468 (SAND—82-0425, pp 109-116)
Beck, E.D., *See* Gordon, R.S., 7:32069
Beckert, K., Beam losses in the storage ring due to charge changing collisions within a beam of Cs^+-ions, 7:32360 (GSI—81-2, pp 268)
Storage ring problems in the HIBALL-scenario, 7:32361 (GSI—81-2, pp 269)
See Mueller, R.W., 7:32359
Beeler, J.R. Jr., Vacancy behavior in a compressed fcc Lennard-Jones crystal, 7:32835 (LA—9121-MS)
Begun, G.M., *See* Maya, L., 7:32238
Beier, R.A., Soot volume fraction profiles in a free combusting boundary layer, 7:31766
Beitz, J.V., *See* Miller, J.R., 7:32227
Bell, A.T., *See* Cant, N.W., 7:32217
Bell, N.E., *See* Petty, S.E., 7:31849
Bellas, G.T., *See* Pan, Y.S., 7:31742
Beller, M., *See* Hermelee, A., 7:31771
Belov, A.G., Methods of gold content determination in geological samples with the use of microtron resonance neutrons, 7:32196 (JINR—18-80-841)

Belyaev, V.A., ATOS-the installation for atom collision investigation, 7:32765 (IAE—3363/7)
Belyaev, V.B., Possible effect of strong interaction on mesic molecule systems properties, 7:32706 (JINR-R—4-81-72)
Belykh, V.S., *See* Abdulakhatov, M.K., 7:31787
Ben-dor, L., *See* Shimony, Y., 7:32233
Benner, J., Variants of ICE-technique with reduction of numerical damping, 7:32720 (KFK—3170)
Bennett, J.G., *See* Girrens, S.P., 7:32594
Benson, R., Satellite observation of cosmic ray air showers, 7:32610
Bentley, G., *See* Ogard, A., 7:32535
Bento Filho, A., Development of a curved beam element model applied to finite elements method, 7:32251 (INIS-mf—6765)
Berecz, I., *See* Bohatka, S., 7:32485
Berezinski, V.S., Binary system as a hidden source of high energy neutrinos, 7:32683
Neutrino moments: the applications for calculation of the rate of events in neutrino detectors, 7:32436
Berger, G., Recent developments in automatic hauling winches, 7:32310
Berglund, G.R., Design for a small-scale fuel-alcohol plant, 7:31841 (EGG-M—04481)
Bernstein, A.M., Variation of βR with probe in inelastic hadron scattering and adequacy of first-order calculations, 7:32801
Berringer, R., *See* Hwang, J.Y., 7:31949
Bertino, J.P., *See* Heaton, R.C., 7:31728
Bertolucci, B., *See* Paffrath, L., 7:32926
Bessent, R.G., *See* Fogelman, I., 7:32553
Best, K.J., Nb-Ti base high-field superconductors with current capacities in excess of 3000 A for application in magnet systems with alternating field components, 7:32844 (BMFT-FB-T—81-009)
Bethge, K., *See* Baumann, H., 7:32180
See Schadt, W., 7:32379
Beyer, H.F., *See* Mann, R., 7:32447
See Schartner, K.H., 7:32380
Bielig, H.J., Influence of technological steps on the heavy metal contamination in foodstuffs, 7:32502
Biersack, J.P., *See* Haggmark, L.G., 7:32716
Biesold, H., Tc enrichment in plants through the roots, 7:32511 (INIS-mf—6902, pp v)
Transfer of Sr and Cs into vegetation through the roots, 7:32508 (INIS-mf—6902, pp v)
Bigelow, J.E., Preparation of a variety of transuranium nuclides in Oak Ridge facilities, 7:32234 (IAEA-CN—40/74P)
Bilgin, O., *See* Chow, T.Y., 7:32064
Binon, F., GAMS-200 hodoscope gamma spectrometer, 7:32392 (IFVE-OEF—80-141)
Bionta, R., Applications of the Cleveland salt mine detector to cosmic rays and cosmology, 7:32437
Birchenough, A.G., *See* Seidel, R.C., 7:31898
Bishop, A.R., Polarons in polyacetylene, 7:32836 (LA-UR—81-3590)
Biskamp, D., Theory of the M = 1 mode in high temperature plasmas, 7:32856 (IPP—6-201)
Bissell, M.J., Differentiated state of normal and malignant cells or how to define a normal cell in culture, 7:32542
Biter, W.J., *See* Szedon, J.R., 7:31851
Bitsadze, G.S., Wide-aperture gas threshold Cherenkov counter, 7:32407 (JINR-R—1-81-30)
Bityukov, S.I., Evaluation of shower parameters by the moments method in hodoscope calorimeters, 7:32393 (IFVE-OEF—81-45)
Bjurina, T.A., *See* Abdrashitov, S.F., 7:32661
Black, R.I., Hot air drum evaporator, 7:31813
Blackinton, G., *See* Andrews, J., 7:32430
Blair, R.E., *See* Barish, B.C., 7:32730
See Rapidis, P.A., 7:32724
Blake, P.R., Muon time spreads in EAS, 7:32618
See Armitage, R., 7:32616, 7:32621
Blamont, J., *See* Jurgens, R.F., 7:32455
Blasche, K., SIS - an accelerator facility for relativistic heavy ions, 7:32317 (GSI—81-2, pp 250-252)
See Malwitz, E., 7:32335
See Wilhelm, K., 7:32219
Blattenberger, G., User's guide to the data tapes from EPRI projects. Research projects 431-1 and 431-2, 7:32092 (EPRI-EA—235-Vol.3)
Bleuel, W., *See* Malwitz, E., 7:32335
Blewer, R.S., *See* Roth, J., 7:32908
Blik, A.M., *See* Bitsadze, G.S., 7:32407
Blocker, C.A., *See* Roussarie, A., 7:32732
Blokh, Ya.L., Neutron emission in the case of the capture of the cosmic ray μ^--meson component in a lead sample, 7:32611
Blondel, A., *See* Roussarie, A., 7:32732
Bloom, E.D., Quark-antiquark bound state spectroscopy and QCD, 7:32755 (SLAC—245, pp 1-40)
Bluethgen, A., *See* Heeschen, W., 7:32499
Bocchio, R., K-Ar radiometric age determinations of the south-Alpine metamorphic complex, western Orobic Alps (Italy), 7:32597
Bochev, B., *See* Druin, V.A., 7:32793
Bock, F., *See* Wiemers, M., 7:32334
Bockwoldt, H.P., Saving fuel oil with fuel-blending and emulsifying systems, 7:32313
Bodvarsson, G., Elastomechanical methods in the exploration of the Valles Caldera, New Mexico. Final report, June 8, 1981-October 8, 1981, 7:31882 (UCRL—15423)
Boehm, E., Separation of hadronic and electromagnetic interactions of muons in Dumand, 7:32433
See Dau, W.D., 7:32432
Boehne, D., Efficiency of a heavy-ion fusion accelerator facility, 7:32362 (GSI—81-2, pp 271)
Boes, J., *See* Brede, O., 7:32224
See Naumann, W., 7:32225
Boettcher, G., *See* Kolb, M., 7:32028
Bogard, W.T., Virtual mass calculation for loss-of-coolant-accident analysis of a pressurized water reactor, 7:32057
Bohatka, S., Contamination measurements with quadrupole mass spectrometer, 7:32485
Bohdansky, J., Combined depth profiling and thermal desorption of implanted deuterium in 304LN stainless steel, 7:32167
Bohm, G.J., Flow induced vibration in the design of nuclear components, 7:31919
Bojchuk, V.N., *See* Grantsev, V.I., 7:32416
Bomelburg, H.J., Use of ammonia in energy-related applications, 7:31831 (PNL-SA—9057)
Bommer, P.M., Streamline-concentration balance model for in-situ uranium leaching and site restoration, 7:31783 (CRWR—180)
Bongaards, D.J., *See* Adkins, C.R., 7:31950
Bonnyman, J., *See* Baldas, J., 7:32229
Boonlualohr, P., *See* Hocking, G., 7:31806
Borcea, E., *See* Belov, A.G., 7:32196
Borden, T., *See* Jurgens, R.F., 7:32455
Borders, J.A., *See* Nelson, G.C., 7:32715
Boreman, J., Impact of entrainment and impingement on fish populations in the Hudson River estuary. Volume I. Entrainment-impact estimates for six fish populations inhabiting the Hudson River estuary, 7:32526 (NUREG/CR—2220-Vol.1)
Borisov, A.A., *See* Bozhko, N.I., 7:32396
Borisovskaya, Z.V., GFUN3D program for computerizing three-dimensional magntostatic fields, 7:32914 (JINR—9-81-304)
Borsaru, M., *See* Clark, G.C., 7:31779
Boruah Kalyanee, *See* Pathak, K.M., 7:32653
Borys, S.S., *See* Tupper, R.B., 7:32038
Bosler, G.E., *See* Phillips, J.R., 7:31820
See Rinard, P.M., 7:31928
Boudart, M., *See* Holstein, W.L., 7:31722
Bourgeois, W., UHV-test-section for SIS, 7:32329 (GSI—81-2, pp 259)
Boyarinov, V.F., Computer code for neutron group calculation of a cylindrical reactor cell (NEGR-Ts), 7:31969 (IAE—3377/5)
Boyarski, A.M., *See* Roussarie, A., 7:32732
Boyd, D.M., Methodology for ranking cities for a solar buildings program, 7:31875 (SSEC/SP—41227, pp 13p, Appendix III)
Boyd, H.A., Determination of americium and plutonium in autopsy tissue: methods and problems, 7:32578
See McInroy, J.F., 7:32577
Boyle, J.F., Navy needs and experience with distillate fuel stability and cleanliness, 7:31760
Boylstein, R.E., *See* Thurman, A.L., 7:32050
Bozhko, N.I., Optimization of drift chamber parameters with wide drift gaps using $Ar+CO_2$ working mixture, 7:32396 (IFVE-ONF—81-24)
Bracco, F.V., Coupling of transport and chemical processes in catalytic combustion. Final report, 7:32305 (DOE/MC/14036—T1)
Bradfield, J., *See* Levi, M.P., 7:32122
Bradner, H., *See* Andrews, J., 7:32430
Braff, C.L., *See* Jirak, G.T., 7:31934
Braga, M., Electronic structure and Moessbauer isomer shift of the iron atom isolated in crystalline argon matrix, 7:32690 (CBPF-A—0004/80)
Brandi, H.S., *See* de Barros, H.G.deP.L., 7:32133

See Koiller, B., 7:32838
Branding, A.E., *See* Persson, S.P.E., 7:31844
Brandt, R., *See* Dersch, G., 7:32349
Bratina, J.E., Assessment of health, safety and environmental impacts of DOE coal conversion process. First technical progress report, 2 July 1980-31 March 1981, 7:31746 (DOE/ET/14746—1)
Bratton, C., *See* Bionta, R., 7:32437
Brau, J.E., Photoproduction of charmed particles at 19.5 GeV, 7:32747 (SLAC—245, pp 441-458)
Bray, A.D., Cosmic ray air showers ($>10^{18}$ eV), 7:32615
Brede, O., Primary processes of the radiation-induced cationic polymerization of aromatic olefins studied by pulse radiolysis, 7:32224 (Zfl-Mitt—35, pp 5-59)
See Naumann, W., 7:32225
Breidenbach, M., *See* Roussarie, A., 7:32732
Breitenberger, G., Preparatory work for the SIS magnet measuring equipment, 7:32341 (GSI—81-2, pp 254)
Prototype thyristor-controlled power supply, 7:32332 (GSI—81-2, pp 255)
Brench, B.L., Application, sizing, testing and performance of the photovoltaic battery subsystem at Natural Bridges National Monument, Utah, 7:31855 (DOE/ET/20279—153)
Brener, S.E., *See* Belyaev, V.B., 7:32706
Brenner, A., Integrated approach to the systematic synthesis, characterization, and catalytic activity of novel heterogeneous catalysts. Final progress report, 7:32206 (DOE/ER/10381—3)
Brentrup, L., *See* Weiland, P., 7:32464
Brewster, D.R., *See* Rundo, J., 7:32580
Brice, D.K., *See* Roth, J., 7:32908
Bricker, O.P., *See* Olsen, C.R., 7:32522
Brierley, C.L., *See* Brierley, J.A., 7:31784
Brierley, J.A., Application of bacterial leaching technology to deep solution-mining conditions for uranium extraction. Final report, September 1, 1978-September 30, 1981, 7:31784 (NP—2902698)
Bright, R., Photovoltaics and electric utilities, 7:31834 (SAND—81-7027)
Brikman, K., *See* Binon, F., 7:32392
Bringer, A., α-γ transition of cerium metal, 7:32164
Brinkman, D.W., Future distillate fuels: what, when, where, and how stable, 7:31828
Brodsky, S.J., Quantum chromodynamics and hadronic interactions at short distances, 7:32756 (SLAC—245, pp 87-140)
Brodzinski, R.L., In situ subterranean determination of actinides by high-resolution gamma-ray spectrometry, 7:31817 (PNL-SA—8992)
Package receipt assay systems, 7:31792 (PNL-SA—10022)
Broelsch, C., *See* Creutzig, H., 7:32562
Brouard, D., *See* Lebey, J., 7:31977
Brown, C.D., *See* Curtiss, J.R.B., 7:32570
See Samuelson, N.H., 7:32924
Brown, D.R., *See* Reilly, R.W., 7:32067
Brown, V.R., *See* Bernstein, A.M., 7:32801
Brown, W.R., *See* Graham, M.J., 7:31807
Bruckenstein, S., Electrochemical apparatus for simultaneously monitoring two gases, 7:32492
Bruechle, W., *See* Lougheed, R.W., 7:32348
Bruegger, M., *See* Mazumdar, A.K., 7:31824
Bruemmer, K.H., *See* Wollers, I.K., 7:31737
Brukhertzajfer, Kh., *See* Orlova, O.A., 7:32790
Brummond, W.A., *See* Tupper, R.B., 7:32038
Brunings, J.E., Direct reactor auxiliary cooling system for the 1000-MWE LMFBR developmental plant, 7:32037
Bryant, E., *See* Ogard, A., 7:32535
Buchholz, D.M., *See* Kirchner, F.R., 7:32591
Buchmeier, W., *See* Berger, G., 7:32310
Budagov, Yu.A., *See* Bitsadze, G.S., 7:32407
Budzynski, M., Study of hyperfine magnetic fields on the impurity of Sm in Fe and Ni ferromagnetic lattices, 7:32154 (JINR-R—14-81-177)
Bugrov, V.N., Duration of ^{238}U fission induced by ^{3}He, 7:32794 (JINR-R—15-80-762)
Bujold, M.P., Small passenger car transmission test: Chevrolet Malibu 200C transmission with lockup, 7:32131 (DOE/NASA/0124—6)
Buklej, A.E., *See* Bayukov, Yu.D., 7:32399
Bull, R.M., *See* Hazen, W.E., 7:32672
See Porter, M.R., 7:32673
Bunker, B.C., Castable ceramics for hydrothermal environments: materials evaluation for the In-Situ Heat Transfer Experiment, 7:31809 (SAND—81-1882)
Bunker, S.S., *See* Freeman, B.E., 7:32477
Burdette, E.G., Report of investigation, first floor slab in ORNL building 9204-1, Y-12 plant, 7:32256 (Y/EN—611)
Burke, D.L., *See* Roussarie, A., 7:32732
Burns, S.J., Thermodynamics of phase-transformation toughening, 7:32170 (DOE/ER/10856—1)
Burov, A.S., *See* Abdurakhimov, A.U., 7:32402
Burris, R.D., EBT data acquisition system control facilities, 7:32920 (ORNL/CSD/TM—166)
Burton, F.G., Use of controlled release herbicides in waste burial sites, 7:31818 (PNL-SA—9503)
Buschman, H.W., Operating experience of the EBR-II steam generating system, 7:31951
Busness, K.M., *See* Hann, C.R., 7:32017
Butcher, T., *See* Krishna, C.R., 7:31739
Butov, I.Ya., *See* Kvartskhava, I.F., 7:32878
Buttseva, G.I., Organization of number sets input/output in the spectrum processing system, 7:32408 (JINR-R—10-81-56)
Buyers, W.J.L., Neutron scattering from spins and phonons in uranium compounds, 7:32819
Buzdavina, N.A., *See* Badalyan, S.G., 7:32410
Bykov, A.A., Intermediate structure in proton resonances, 7:32771 (JINR-R—15-80-786)
Bystritskaya, E.V., ADSERV computer code for data processing from proportional chambers, 7:32401 (ITEF—176(1980))

C

Cachon, A., Analysis of giant air showers, 7:32632
Camaioni, D.M., *See* Franz, J.A., 7:31719
Camerini, U., *See* McGibney, D.J., 7:32427
Campbell, D.K., Polyacetylene: a real material linking condensed matter and field theory, 7:32754 (LA-UR—81-3636)
See Bishop, A.R., 7:32836
Campbell, G.W., Calibration of phoswich detectors for assessment of plutonium in lungs: the methods of four laboratories compared, 7:32823
See Anderson, A.L., 7:32579
Cannon, P.H., *See* Swoboda, C.A., 7:32127
Cant, N.W., Studies of carbon monoxide hydrogenation over ruthenium using transient response techniques, 7:32217
Capdevielle, J.N., *See* Cachon, A., 7:32632
Card, J.C., *See* Chu, C.R., 7:31799
Carithers, W.C., *See* Roussarie, A., 7:32732
Carlson, T.A., Photoelectron spectroscopy of methyl, ethyl and isopropyl alcohol adsorbed on the (110) surface of Cu, 7:32713
Carmi, U., Study of the ion-molecule reaction in a microwave plasma of propylene, 7:32701 (IA—1364, pp 71)
Carnes, B.A., Multivariate methods for assessing disease/environment association: conceptual versus geographic regions, 7:32569
Carosella, D.P., *See* Hurn, E.J., 7:32040
Carpenter, J.H., *See* Jolley, R.L., 7:32528
Carr, R.W. Jr., Studies in chemical reactivity. Progress report, November 30, 1980-1 December 1981, 7:32222 (DOE/ER/02026—41)
Carrano, A.V., Regional gene mapping of human chromosomes purified by flow sorting, 7:32544
Carreras, B.A., *See* Holmes, J.A., 7:32875
Carter, J.G., Gas mixtures for gas-filled radiation detectors, 7:32423
See Timmerman, C.L., 7:31804
Castagnoli, C., Observation of EAS Cerenkov light reflected from mountain snow, 7:32643
Castleman, A.W. Jr., Nucleation and growth of stratospheric aerosols, 7:32489
Cataldo, D.A., *See* Burton, F.G., 7:31818
Caton, J.E., Comparison of several methods for collection and quantification of polycyclic aromatic hydrocarbons from aqueous media, 7:32530
Catto, P.J., *See* Tsang, K.T., 7:32877
Cawley, W.E., Submergible barge retrievable storage and permanent disposal system for radioactive waste, 7:31812

Cecco, V.S., Eddy-current testing: manual on eddy-current method, 7:32442 (AECL—7523-Vol.1)
Ceravolo, C., *See* Clark, G.C., 7:31779
Chamberlain, R.G., Normative price for energy from an electricity-generation system: an owner-dependent methodology for energy generation (system) assessment (OMEGA). Volume II. Derivation of system energy price equations, 7:31856 (DOE/ET/20356—5)
Chan, S.H., Thermal radiation properties of ThO/sub 2/ in contact with sodium and steel, 7:31996
Chang, F.H., *See* Silling, S.A., 7:32054
Chang, H.I., *See* Lee, G.S., 7:31926
Chang, I.S., Dynamics study of AUC precipitation. Studies on the reconversion of UF_6, 7:32236 (KAERI/RR—241/80)
Chang, J.W., *See* Lee, C.K., 7:31923
See Lee, J.B., 7:31924
Chang, K.S., *See* Chang, I.S., 7:32236
Chanowitz, M.S., Meson spectroscopy: quark states and glueballs, 7:32743 (SLAC—245, pp 41-86)
Review of meson spectroscopy: quark states and glueballs, 7:32709 (LBL—13593)
Chantler, M.P., Lateral distribution of Cerenkov light in cosmic ray showers, 7:32648
See Andam, A.A., 7:32628, 7:32649, 7:32650
Chapin, T.J., Development and performance of a high pressure hydrogen time projection chamber, 7:32369 (DOE/ER/40033—13)
Charakhchyan, A.N., *See* Khristiansen, G.B., 7:32656
Charakhchyan, T.N., *See* Khristiansen, G.B., 7:32656
Chaudhuri, N., *See* Ghoshdastidar, M.R., 7:32751
Chaves, C.M.G.F., Remarks on the percolation problem in anisotropic systems, 7:32839 (PUC-tn—18/79)
See Riera, R., 7:32837
Cheatham, R.L., *See* Khan, E.U., 7:31948
Chelnokov, L.P., *See* Ter-Akop'yan, G.M., 7:32411
Chen, C.H., *See* Chow, T.Y., 7:32064
Chen, C.H.T., Interacting sp-boson model with isospin: an unified description of giant multipole resonances and other collective motions, 7:32797 (IFUSP-P—240)
See Galeao, A.P.N.R., 7:32788
Chen, D.J., *See* Strniste, G.F., 7:32587
Chen, H., *See* Wen, C.Y., 7:31716
Chen, P.Y., Flow-induced vibration design guidelines, 1981, 7:32060
Chen, S., Vibration of a group of circular cylinders subjected to fluid flow, 7:31990
Chenoweth, J.M., *See* Halle, H., 7:32257
Chepigin, V.I., *See* Orlova, O.A., 7:32790
Cherevatenko, E.P., *See* Serov, A.Ya., 7:32766
Cherian, P., *See* Hecht, A., 7:32290
Cherkasova, T.I., *See* Dedov, V.B., 7:32191
Chernyavski, M.M., *See* Maslennikova, N.U., 7:32735
Chichkin, N.A., *See* Barnaulova, T.V., 7:32398
Chinowsky, W., *See* Roussarie, A., 7:32732
Cho, D.S., *See* Nahm, K.J., 7:31940
Cho, K.H., *See* Nahm, K.J., 7:31940
Cho, S.W., *See* Chung, M.K., 7:31925
Cho, Y.M., *See* Nahm, K.J., 7:31940
Chockie, A.D., Pacific Northwest biomass as an energy resource, 7:31850 (PNL-SA—9982)
Choffe, B., *See* Rojey, A., 7:32118
Choi, S.K., *See* Suh, K.S., 7:31994
Choj Val Sek, *See* Orlova, O.A., 7:32790
Chosnovska, V., Concentration of trace elements from Cheleken peninsula thermal brines by means of foam flotation, 7:32195 (JINR—6-81-75)
Chou, H.P., *See* Johnson, R.H., 7:32008
Chou, Y.H., *See* Chapin, T.J., 7:32369
Chow, T.Y., Evaluation of pipe support stiffness and its effect on piping response, 7:32064
Choyke, W.J., *See* Spitznagel, J.A., 7:32887
Christensen, R.N., Mixed convection in rectangular channel flow with smooth surfaces and one heated wall, 7:31814
Christensen, S.W., *See* Boreman, J., 7:32526
Christman, D., *See* Reivich, M., 7:32540
Christmann, R., *See* Fradj, M., 7:32337
See Wilms, D., 7:32340
Christophorou, L.G., *See* Carter, J.G., 7:32423
Chu, C.R., Study of droplet formation for preparation of spheres by internal gelation, 7:31799 (ORNL/MIT—337)
Chu, Y.K., *See* Barish, B.C., 7:32730
Chudakov, A.E., Data on multicore air showers and cross-section of high-transverse momentum jets production at $\sqrt{S}$ approximately 500 GeV, 7:32676
Chudin, N.V., *See* Vikhrev, V.V., 7:32854
Chujkov, M.I., *See* Lantsov, M.N., 7:32000
Chun, B.J., *See* Lee, C.K., 7:31923
See Lee, J.B., 7:31924
Chung, C.T., *See* Ha, C.W., 7:32415
Chung, J.N., *See* Grosshandler, W.L., 7:31740
Chung, J.S., *See* Suh, K.S., 7:31994
Chung, M.K., Improvement of failed fuel detection system of light water reactor, 7:31925 (KAERI/RR—226/80)
See Lee, Y.W., 7:32032
Chung, S.H., *See* Lee, G.S., 7:31926
Chung, S.T., *See* Kang, Y.H., 7:31939
Chung, Y.M., *See* Lee, Y.P., 7:32453
Churakov, A.K., *See* Volkov, N.G., 7:32403
Chynoweth, D.P., Biothermal conversion of biomass to methane and alcohols, 7:31836 (CONF-820217—4)
Ciccone, V.J., *See* Garrigan, G.A., 7:31865
Cipollini, N.E., *See* Holroyd, R.A., 7:32226
Ciszek, T.F., Method and apparatus for drawing monocrystalline ribbon from a melt, 7:32186
Claridge, D.E., *See* Morrison, L.S., 7:32116
Clark, G.C., Field trial of CSIRO intrinsic germanium and natural gamma sirolog probes at AMDEL uranium calibration test pits, 7:31779 (INIS-mf—6752)
Clark, G.L., Generic methods for design of small-bore pipe supports, 7:32063
Clarke, M.M., Color coding of televised task elements in remote work: a literature review with practical recommendations for a fuel reprocessing facility, 7:31788 (ORAU—190)
Class, G., Multi-vent system problems, 7:32023 (GKSS—81/E/27, pp II 3-24)
Clay, R.W., *See* Gerhardy, P.R., 7:32664
See Kuhlmann, J.D., 7:32639
See Liebing, D.F., 7:32636
Clayton, N.L., *See* Setlow, J.K., 7:32545
Clikeman, F.M., *See* Johnson, R.H., 7:32008
Cline, J.F., *See* Burton, F.G., 7:31818
Cline, M.C., VNAP2: a computer program for computation of two-dimensional, time-dependent, compressible, turbulent flow, 7:32276 (LA—8872)
Coderre, W.J., *See* Sullivan, L.D., 7:32107
Cohen, S., Overview of fusion reactor safety, 7:32879 (CONF-810801—59)
Cole, C.R., Assessment of effectiveness of geologic isolation systems. Radionuclide-transport sensitivity studies, 7:31802 (PNL-SA—8927)
Collen, J., Analysis of pressure oscillations and pressure spikes in the Marviken pressure suppression containment, 7:32025 (GKSS—81/E/27, pp II 35-48)
Collins, J.J., Use of a demographic model for health risk assessment, 7:32590
See Carnes, B.A., 7:32569
Collins, W.W., Network file-storage system, 7:32919 (LA-UR—81-3558)
Coltman, R.R. Jr., Rates of defect production by fission neutrons in metals at 4.7 K, 7:32163
Connolly, J.F., *See* Bateman, J.E., 7:32421
Conti, P.S., Observations of stellar winds in early type stars, 7:32679
See van der Hucht, K.A., 7:32682
Cool, R.L., *See* Chapin, T.J., 7:32369
Cooper, M.B., Natural radioactivity in the production of titanium dioxide pigment: a study of the Laporte Plant and environment behaviour of radionuclides at Bunbury, Western Australia, 7:32504 (ARL/TR—037)
Corbett, B.L., High flux isotope reactor. Quarterly report, January, February, and March 1981, 7:32011 (ORNL/TM—8147)
High flux isotope reactor. Quarterly report, April, May, and June 1981, 7:32012 (ORNL/TM—8169)
Corey, J.C., Management of soil systems for the disposal of industrial wastes, 7:32497 (DP-MS—81-72)
Corliss, L.M., *See* Zhuang, J., 7:32176
Cortez, B., *See* Bionta, R., 7:32437
Costa, J.A. Jr., Nonlinear theory of elastic shells, 7:32250 (INIS-mf—6729)
Costa-Ribeiro, C., *See* Cullen, T.L., 7:32521
Cousseran, P., *See* Lebey, J., 7:31977
Coutinho Filho, M.D., *See* Yokoi, C.S.O., 7:32834
Cowley, J.M., Diffraction from crystals. Chapter 6.5. Neutron diffraction structure analysis, 7:32818
Radiations and their scattering by matter. Chapter 4.3. Neutrons, 7:32817
Coy, R.N., Average properties and fluctuations of the lateral distribution of large air showers, 7:32623

Multi-parameter measurements of shower structure above 10^{17}eV, 7:32625
Craig, M.A.B., *See* Andam, A.A., 7:32628, 7:32649, 7:32650
See Chantler, M.P., 7:32648
Crandall, K.R., Octupole focusing in transport and acceleration systems, 7:32326 (LA-UR—81-3058)
Cranshaw, T.E., Design of a servo system for a Moessbauer spectrometer, 7:32443 (AERE-R—10207)
Moessbauer spectrometer for difficult isotopes, 7:32368 (AERE-R—10206)
Creutz, M., Phase transitions and elementary-particle physics, 7:32752 (BNL—30432)
Creutzig, H., Arterial contribution to total liver perfusion, 7:32562
'Sickle-sign' in bone scintigraphy, 7:32554
Crites, T.R., *See* Barker, C.J., 7:32505
Crocker, J.G., *See* Cohen, S., 7:32879
Croff, A.G., Graphical and tabular summaries of decay characteristics for once-through PWR, LMFBR, and FFTF fuel cycle materials, 7:31956 (ORNL/TM—8061)
Crowe, C.T., *See* Grosshandler, W.L., 7:31740
Crowther, R.L., *See* Wei, P., 7:31917
Csirik, J., Influence of radiation detector dead time upon count rate statistics, 7:32441
Cullen, T.L., Two decades of research in the Brazilian areas of high natural radioactivity, 7:32521 (PUC-tn—02/80)
Curio, A.R., *See* Pan, Y.S., 7:31742
Curkendall, D., *See* Jurgens, R.F., 7:32455
Curran, D.R., *See* McHugh, S.L., 7:31769, 7:31770
Curtis, P.M., *See* Bracco, F.V., 7:32305
Curtiss, J.R.B., Human birth weight patterns as an indicator of populations subject to environmental stress, 7:32570
Cutshall, N.H., *See* Olsen, C.R., 7:32522

D

D'Acierno, J., *See* Hermelee, A., 7:31771
D'Amico, K., *See* Jackson, S.A., 7:32557
da Silva, R.P., Electronic system of TBR tokamak device, 7:32889 (INIS-mf—6769)
See do Nascimento, I.C., 7:32888
da Silva, X.A., *See* Palermo, L., 7:32134, 7:32692
Daban-Haurou, J.L., *See* Meunier, R., 7:32346
Dach, W., *See* Creutzig, H., 7:32554
Dadykin, V.L., μ-e decay investigation at the Mt. Blanc station, 7:32439
Dahl, L., Method for computer aided alignment of the Unilac beam, 7:32339 (GSI—81-2, pp 240)
On-line transverse beam matching at the Unilac, 7:32338 (GSI—81-2, pp 239)
Dalal, V., Improved amorphous Si solar cells. Quarterly progress report No. 5, February 1-April 30, 1981, 7:31852 (SERI/PR—9195-1-T3)
Dalbey, W.E., *See* Witschi, H., 7:32585
Dalle Donne, M., Measurements of density and of thermal expansion coefficient of sodium tetraborate (borax)-UO_2 and of sodium metaborate-UO_2 solutions, 7:32174 (KFK—3088)
Dam, A.S., *See* Patti, F.J., 7:32039
Daniels, W.R., *See* Erdal, B.R., 7:31795
See Vine, E.N., 7:32523
Danilkin, S.A., Inelastic neutron scattering study on crystal lattice dynamics of vanadium-oxygen interstitial solid solutions, 7:32171 (FEI—1109)
See Morozov, S.I., 7:32807
Danilova, T.V., Usage of small EAS with Nsub(e) approximately 10^4 at mountains for the calibration of the interaction model, 7:32657
Dann, R., *See* Reivich, M., 7:32540
Danon, J., *See* Braga, M., 7:32690
Darby, S.C., *See* Sumerling, T.J., 7:32418
Dariel, M.P., *See* Gurewitz, E., 7:32209, 7:32210
Datz, S., *See* Overbury, S.H., 7:32714
Dau, W.D., Muons with high energy transfer in Dumand, 7:32432
See Boehm, E., 7:32433
David, F., Radiopolarography of mendelevium in aqueous solutions, 7:32243
Davis, C.G., *See* Freeman, B.E., 7:32477
Davis, M.E., Ground-water levels in Alabama. For observation wells measured periodically, August 1952-July 1977. Circular 105, 7:32595 (NP—2902469)
Davis, M.J., Effects of atmospheric deposition of energy-related pollutants on water quality: a review and assessment, 7:32478 (ANL/AA—26)
Dawson, L.R., Liquid phase epitaxy techniques for compound semiconductor growth, 7:32185 (SAND—82-0025C)
de Barrau, M., French electromechanical industry in the nuclear sector, 7:31915 (FRNC-CONF—206)
de Barros, H.G.deP.L., ns-ms excitation of alkali atoms in the Glauber approximation, 7:32133 (CBPF-A—0017/80)
See de Giambiagi, M.S., 7:32691
de Barros Leite, C.V., *See* Baptista, G.B., 7:32202
De Capitani, L., *See* Bocchio, R., 7:32597
de Castro Faria, L.V., *See* Montenegro, E.C., 7:32201
de Freitas, C.T., Uranium dioxide sintering kinetics and mechanisms under controlled oxygen potentials, 7:32235 (IEA-DT—141)
de Giambiagi, M.S., Convergence problems and energetic regions in π excited states of certain conjugated molecules, 7:32691 (CBPF-A—0005/80)
de Magalhaes, A.C.N., Renormalization group treatment of bond percolation in anisotropic and 'inhomogeneous' planar lattices, 7:32826 (CBPF-A—0013/80)
See Tsallis, C., 7:32179
de Moura Neto, C., Decay constants of a subcritical system by two-group diffusion theory, 7:31960 (CTA-EAV—007/79)
Fast neutron physics. Estimation of the results of diffusion theory applied to small dimension systems, 7:31961 (CTA-EAV—024/79)
Heterogeneous reactors, 7:31962 (CTA-EAV-NT—011/79)
de Oliveira, P.M.C., *See* Chaves, C.M.G.F., 7:32839
See Riera, R., 7:32837
de Passos, E.J.V., Collective motion and the generator coordinate method, 7:32796 (IFUSP-P—206)
Study of the relationship between the semi-classical and the generator coordinate methods, 7:32804 (IFUSP-P—241)
de Queiroz, S.L.A., *See* Chaves, C.M.G.F., 7:32839
See Riera, R., 7:32837
de Reggi, M.L., *See* Strambi, C., 7:32550
de Souza Cruz, F.F., *See* de Passos, E.J.V., 7:32804
de Toledo, A.S., Low angular-momentum-cutoff in statistical heavy-ion processes, 7:32768 (IFUSP-P—244)
Deason, V.A., *See* Fincke, J.R., 7:32016
Debray, D., High-pressure neutron and X-ray diffraction study of TmSe, 7:32165
Decker, D.L., *See* Debray, D., 7:32165
Dedenko, L.G., Calculation of electron-photon cascades in the energy range of 10^{15}-10^{19} eV taking into account the LPM effect, 7:32750
Lateral distributions of electrons and muons in EAS, 7:32631
Dedov, V.B., Possibility of chromatographic separation of curium and californium on phosphorus- and phosphorus-nitrogen-containing ionites, 7:32191 (IAE—3303/13)
Deenski, P.A., Elastic d-d small angle scattering at 4.6 GeV/c, 7:32725 (JINR—1-81-82)
DeGeorge, C.L., *See* Geiling, D.W., 7:31906
Dehnhardt, W., *See* Wilms, D., 7:32340
Deiss, S., *See* Paffrath, L., 7:32926
Deitinghoff, H., Proton model of a heavy-ion RFQ accelerator, 7:32320 (GSI—81-2, pp 265)
Dekusar, V.M., DOPPLER program for calculating the Doppler temperature reactivity coefficient, 7:31964 (FEI—1097)
Del Bosco, E., *See* do Nascimento, I.C., 7:32888
Delaage, M.A., *See* Strambi, C., 7:32550
Dellaqua, R., *See* do Nascimento, I.C., 7:32888
Demidov, V.S., *See* Avdeev, N.F., 7:32400
Demidov, V.V., *See* Barnaulova, T.V., 7:32398
Demmitt, T.F., *See* Molton, P.M., 7:31854
Demuth, O.J., Analyses of mixed hydrocarbon binary thermodynamic cycles for moderate temperature geothermal resources, 7:31893 (CONF-810812—42)
Denes, E., Program package for data preparation of RISK events. Pt. 1. The description of program SMHV, 7:32406 (JINR—E-10-80-787)
Dengler, J., *See* Albrecht, R., 7:32378
Denton, B.A., *See* Green, P.J., 7:32662
Dersch, G., Window- and target-system for damped heavy-ion reactions at the gasjet with intense heavy-ion beams, 7:32349 (GSI—81-2, pp 194)
Deryuga, V.A., *See* Budzynski, M., 7:32154

deSaussure, G., *See* March-Leuba, J.A., 7:31959
Deshurko, M.D., Calculation of cascade curves for interactions of protons and nuclei of energy >= approximately 1 TeV/nucleon in lead, 7:32608
Desportes, H., Stability and fast heat removal with He-II cooling for pulsed superconductive magnets, 7:32262
Deutsch, E.A., *See* Heineman, W.R., 7:32231
Deutsch, W.J., Solid phases limiting the concentration of dissolved constituents in basalt aquifers of the Columbia Plateau in eastern Washington, 7:32602 (PNL-SA—9848)
Devaney, M.J., *See* Collins, W.W., 7:32919
DeVilliers, S.J., *See* Vine, E.N., 7:32523
Diamond, S., Hydration reactions of C_3A contained in an unusual flyash, 7:31723 (DOE/CS/40222—2)
Diaz, T.P., *See* Hughes, N.R., 7:32047
Dickey, H.C., *See* Szedon, J.R., 7:31851
Dickson, B.L., *See* Clark, G.C., 7:31779
Diel, R., Investment requirements in the energy sector and their financing, 7:32097 (NP—2901055)
Dietrich, W.C., Potentiometric determination of percent porosity in nickel electroplates on uranium metal, 7:32161 (Y/DW—282)
Diminstein, O.S., Fluctuations of density flux and lateral distribution of EAS particles with $E_0 >= 10^{17}$eV, 7:32624
Dionisi, C., Charm particle production in hadronic interactions: recent results from CERN at SPS energies, 7:32728 (SLAC—245, pp 477-494)
Dirner, A., *See* Badalyan, S.G., 7:32410
Dittmar, H., *See* Arlt, U., 7:32388
Dittner, P.F., *See* Overbury, S.H., 7:32714
do Amorim, E.S., *See* de Moura Neto, C., 7:31961
Do Dang, G., *See* Ramavataram, S., 7:32767
do Nascimento, I.C., Preliminary results of the TBR-small Tokamak, 7:32888 (IFUSP-P—270)
Dobisz, E.A., *See* Guo, K.J., 7:31887
Doblin, C.C., Growth of energy consumption and prices in the USA, FRG, France, and the UK, 1950-1979, 7:32110 (IIASA-WP—80-126)
Dobrynin, Yu.L., Possibility of application of crystals scintillators on the basis of ammonium iodides and other analogous compounds as fast neutron detectors, 7:32389 (IAE—3281/2)
Dobrzynski, K., *See* Chudakov, A.E., 7:32676
Dobson, R.L., *See* Straume, T., 7:32574
Dohmann, H.D., Eight crystal X-ray spectrometer, 7:32446 (GSI—81-2, pp 196)
Dolgov, V.A., *See* Andrzejewski, J., 7:32779
Domokos, G., Research in theoretical physics. Annual progress report, April 1, 1981-March 31, 1982, 7:32738 (DOE/ER/03285—41)
Search for excited leptons in the next generation of experiments, 7:32722 (DOE/ER/03285—40)
Dong, R.G., Size effect related to damping caused by water submersion, 7:32053
Donoghue, J.F., *See* Olsen, C.R., 7:32522
Doran, J.C., Dependence of vertical wind shear fluctuations on averaging times, 7:32475 (PNL-SA—8705)
Dorfan, J., Early results from the MKII detector at PEP, 7:32366 (SLAC—245, pp 569-601)
Dormehl, I.C., Detection of abscesses and lymphosarcoma with ^{111}In-deferoxamine mesylate, 7:32563
Dorner, S., *See* Dalle Donne, M., 7:32174
Dorovskii, A.P., *See* Belyaev, V.A., 7:32765
Dosch, M.W., Drilling and operating oil, gas, and geothermal wells in an H_2S environment, 7:31892 (NP—2902054)
Dougan, R., *See* David, F., 7:32243
Douglas, J., Amorphous metals: cutting losses in the core, 7:32086
Douglas, R.A., *See* Nakayama, K., 7:32391
Drake, D.M., E2 isovector giant resonance as seen through the capture of fast neutrons, 7:32795 (LA—9026)
Drake, G.A., *See* Thomas, R.G., 7:32573
Draper, B.L., *See* McBrayer, J.D., 7:31886
Drescher, G., Determination of critical boiling conditions within the whole steam content range for internal pipe flow, 7:32278
Drouffe, J.M., High-temperature expansion and Monte Carlo simulation of SU(5) gauge theory on a four-dimensional lattice: A comparison, 7:32760
Drucker, H., *See* Gray, R.H., 7:32536
Druin, V.A., Spontaneous fission of heavy isotopes of nielsbohrium (Z=105) and element 106, 7:32793 (JINR-R—7-12056)
Dryapachenko, I.P., *See* Grantsev, V.I., 7:32416
Dubrovin, M.M., *See* Belyaev, V.A., 7:32765
Dudareva, T.N., *See* Borisovskaya, Z.V., 7:32914
Duffy, C., *See* Ogard, A., 7:32535
Duimstra, C.O., In-situ tuff water migration/heater experiment: hardware mechanical design definition, 7:31808 (SAND—81-1048)
Dunn, B., Advanced-battery electrochemical-process development. Final report, 7:32071 (NYSERDA—80-36)
DuPlessis, P. de V., *See* Buyers, W.J.L., 7:32819
Durocher, P., Energy conservation management conference, 7:32089 (CONF-810370—)
Dusek, J., *See* Albrecht, R., 7:32378
Dutta, P.K., Calibration characteristics of IRAD GAGE vibrating wire stressmeter at normal and high temperature. Volume 1, 7:32458 (UCRL—15426-Vol.1)
Calibration characteristics of IRAD GAGE vibrating wire stressmeter at normal and high temperature. Volume 2, 7:32459 (UCRL—15426-Vol.2)
Duvel, W.A. Jr., State-of-the-art of FGD sludge fixation. Final report, 7:31727 (EPRI-FP—671-Vol.3)
Dyakonov, M.N., Drift of depth of EAS maximum development with primary energy $10^{18} + 10^{19}$eV, 7:32644
Effect of the earth's magnetic field in the large zenith angle EAS of superhigh energies, 7:32633
Flux density fluctuations of the EAS atmospheric Cerenkov light with primary energy above 10^{17}eV, 7:32645
Simulation of measurements at the Yakutsk complex EAS array, 7:32634
Dyer, P.E., Repetitively pulsed sealed-TE CO_2 laser using an oxygen tolerant discharge scheme, 7:32266
Dyuran, I., *See* Aguilar-Benitez, M., 7:32395
Dzikowski, T., Fluctuations of the muon and electron lateral distributions in extensive air showers, 7:32660

E

Eastman, M.P., Electron paramagnetic resonance and crystal structure study of bis(triphenylphosphine)iminium hexafluorouranate(V), 7:32239
Echterhoff, U., Nondestructive tests on soldered joints, 7:32285
Eckhardt, H., *See* Wilhelm, K., 7:32219
Eckstein, A., *See* Mogul, J., 7:31907
Eddleman, H., Microorganisms for fermentation of crop residues. Final technical report, 7:31839 (DOE/R5/10222—1)
Edmonds, J.A., *See* Reister, D.B., 7:32091
Edwin, K.W., Data inaccuracies in reliability calculations of technical systems, 7:32297
Efimov, N.N., *See* Diminstein, O.S., 7:32624
Efremov, Yu.V., *See* Pevtsov, V.V., 7:32417
Egler, W., Mathematical modelling of the atmospheric distribution of cooling tower plumes, 7:32495
Egorov, T.A., *See* Dyakonov, M.N., 7:32633, 7:32644
Egorova, V.P., *See* Dyakonov, M.N., 7:32633, 7:32644
Ehlbakyan, S.S., *See* Amatuni, A.T., 7:32849
Ehret, C.F., Chronopharmacology of L-DOPA: implications for orthochronal therapy in the prevention of circadian dyschronism, 7:32568
Ehrlich, A., *See* Wiemers, M., 7:32334
Eichler, H.J., Optimization of the uv CuII Laser, 7:32269
Eichmeyer, H., Colloquium on underground working and tunnelling, 7:31731 (CONF-790273—(Vol3))
Eisenbud, M., *See* Cullen, T.L., 7:32521
Eknoyan, O., Gallium phosphide devices, 7:31883 (SAND—82-0425, pp 17-20)
El-Masri, M.A., *See* Motakef, S., 7:31905
El'shin, A.V., *See* Laletin, N.I., 7:31968
Eller, P.G., *See* Eastman, M.P., 7:32239
Elliott, R.N., *See* Levi, M.P., 7:32122
Ellis, D.E., *See* Guenzburger, D.J.R., 7:32827
Ellis, J., Technicolour - oasis or mirage, 7:32758 (SLAC—245, pp 621-640)
Ellison, D.C., *See* Kazanas, D., 7:32684
Ellsaesser, H.W., Should we trust models or observations, 7:32483
Elson, L., *See* Jurgens, R.F., 7:32455
Emmerling, M., Amplitude, frequency and phase control for the SIS accelerating cavities, 7:32343 (GSI—81-2, pp 258)

New capacitive tuners for the single-gap-cavities, 7:32331 (GSI—81-2, pp 244)
See Blasche, K., 7:32317
See Kaspar, K., 7:32333
Engel, B., Calculation of the load from short circuit currents in high-voltage systems with non-bunched conductor cables, 7:31912 (NP—2901106)
England, C.D., *See* Coy, R.N., 7:32623, 7:32625
Englert, G., *See* Strehl, P., 7:32336
Englert, J.P., Environmental surveillance plan for the Department of Energy's Niagara Falls Storage Site (NFSS), Lewiston, New York, 7:31797 (NLCO—008EV)
English, C.J. Jr., *See* Petty, S.E., 7:31849
Eppel, D., *See* Tanzer, F., 7:32328
Erdal, B.R., Research and development related to the Nevada Nuclear Waste Storage Investigations. Progress report, April 1-June 30, 1981, 7:31795 (LA—8959-PR)
See Vine, E.N., 7:32523
Erez, G., *See* Lavi, S., 7:32851
Erlykin, A.D., *See* Danilova, T.V., 7:32657
Ertan, F., *See* Wiemers, M., 7:32334
Eshcherkin, V.M., *See* Shmelev, V.E., 7:31958
Essling, M.A., *See* Rundo, J., 7:32580
Eue, H.J., Rehabilitation of a coal conveyor system at Frimmersdorf power station following a fire, 7:31909
Eutsler, B.C., *See* Boyd, H.A., 7:32578
See McInroy, J.F., 7:32577
Evdokimov, A.G., *See* Abdulakhatov, M.K., 7:31787

F

Faeser, R.J., Combustion enhancement and pollutant control research with acoustically induced mixing. Technical progress report, September 1981-December 1981, 7:31741 (DOE/PC/40270—3)
Fagundes, A.N., *See* do Nascimento, I.C., 7:32888
Fairchild, C.I., Wind tunnel measurements of the resuspension of ideal particles, 7:32484
Fajula, F., Methane and methanol synthesis over supported palladium catalysts, 7:31830
Fakhrutdinov, R.M., *See* Bozhko, N.I., 7:32396
Falater, S.L., Universal high temperature CMOS logic, 7:32303 (SAND—82-0425, pp 117-124)
Farkas, T., *See* Reivich, M., 7:32540
Farr, W., *See* Walter, P. v., 7:32375
Fasman, G.D., Nucleic acid-protein interactions: conformational studies. Progress report, September 1, 1978-August 31, 1981, 7:32541 (DOE/EV/04962—3)
Fass, R., *See* Huber, G., 7:32385
Fatemi, J., *See* Abdullah, M.M., 7:32659
Feather, J.I., *See* Kruger, P.J., 7:32419
Fedeli, G., *See* Galli, G., 7:32555
Fedotovskii, V.S., Inertial and damping properties of a two-phase mixture with surface-active agents, 7:31981 (FEI—1104)
Fedra, K., Mathematical modelling - a management tool for aquatic ecosystems, 7:32525
Fedro, A.J., Dynamical susceptibility and neutron scattering cross section of a model mixed-valence system, 7:32821
Fedyanin, V.K., *See* Gavrilenko, G.M., 7:32707
Fefilov, B.V., Multi-channel amplitude analyzer on the basis of the MERA-60 microcomputer, 7:32451 (JINR—13-81-11)
Felix, W.D., Chemical/biological characterization of SRC-II product and by-products, 7:31747 (PNL-SA—8813)
Fengler, G., Reliability studies in a power plant system, 7:31910
Fennern, L.E., *See* Wei, P., 7:31917
Ferber, H., *See* Santosa, S., 7:32148
Fernandes, G.P., Determination of the uranium concentration in soil solutions by the fission track registration technique, 7:31780 (INIS-mf—6777)
Ferraro, A., *See* Steigerwald, R.L., 7:31857
Ferraro, R., *See* Lihach, N., 7:32085
Ferris, S., *See* Reivich, M., 7:32540
Filippov, G.N., *See* Bozhko, N.I., 7:32396
Filippov, V.N., *See* Likhachev, Yu.I., 7:31936
Filio, J.P., *See* Bratina, J.E., 7:31746
Fincke, J.R., Holographic investigation of nonequilibrium vapor generation in a two-dimensional nozzle, 7:32016 (EGG-M—02381)
Fink, R.W., Nuclear chemistry research and spectroscopy with radioactive sources. Seventeenth annual progress report, 7:32787 (DOE/ER/03346—T1)
Finke, P., *See* Bourgeois, W., 7:32329
Fischer, B.E., Heavy ion microprobe - a status report, 7:32386 (GSI—81-2, pp 199)
Preparation of superinsulating surfaces by the nuclear track-technique, 7:32302 (GSI—81-2, pp 178)
Fischer, F., Methods of availability planning for process structures with interim storage, 7:31790
Fischer, P.M., Interim storage requirements for spent LWR fuel elements for alternative scenarios of an increased use of nuclear energy in the Federal Republic of Germany, 7:31791 (KFK—3084)
Fischer, W.H., *See* Sullivan, L.D., 7:32107
Fisher, E.S., Single crystal metal wedges for surface acoustic wave propagation, 7:32284
Flaig, H.J., *See* Schartner, K.H., 7:32380
Flannery, M.R., Cross sections for electron impact ionisation of metastable rare-gas excimers ($He_2sup(*)$, $Kr_2sup(*)$, $Xe_2sup(*)$), 7:32712
Fleischman, R.M., *See* Newman, D.F., 7:31918
Flora, J.H., Computer intelligence design for automatic inspection of steam generator tubes, 7:31931
Focacci, C., *See* Galli, G., 7:32555
Fogelman, I., Critical assessment of bone scan quantitation (bone to soft tissue ratios) in the diagnosis of metabolic bone disease, 7:32553
Folger, H., *See* Lougheed, R.W., 7:32348
Fomin, Y.A., *See* Grishina, N.V., 7:32614
Fomin, Yu.A., *See* Khristiansen, G.B., 7:32656
Foresti, R.J. Jr., Corrosion and scaling in solar heating systems, 7:31874 (SOLAR/0909—81/70)
Foroughi, M., Heavy metal contents of leaf vegetables in relation to increasing amounts of garbage sewage sludge composts applied in pot experiments, 7:32503
Forycki, A., *See* Guzik, Z., 7:32450
Foster, J.M., Evaluation of systematic errors affecting measurements of radial distributions of particles or subcores about air shower axes, 7:32674
See Hazen, W.E., 7:32672
Fowler, J., *See* Reivich, M., 7:32540
Fox, G., Untangling jets from hadronic final states, 7:32744 (SLAC—245, pp 141-193)
Fradj, M., Fast measurement of charge state distributions behind the stripper, 7:32337 (GSI—81-2, pp 238)
See Wilms, D., 7:32340
Franca, E.P., *See* Cullen, T.L., 7:32521
Franczak, B., Lattice of the booster synchrotron SIS40, 7:32318 (GSI—81-2, pp 253)
MIRKO - an interactive computer program for ion-optical systems, 7:32323 (GSI—81-2, pp 260)
See Blasche, K., 7:32317
Frank, I.M., *See* Kobzev, A.P., 7:32813
Franz, J.A., Radical pathways of coal dissolution in donor media during reactions of coals and specifically deuterated tetralin, 7:31719 (PNL-SA—9020)
Franzke, B., *See* Blasche, K., 7:32317
See Bourgeois, W., 7:32329
Fredo, S., *See* Mintz, M.H., 7:32700
Freeman, B.E., Nocturnal drainage flow over complex terrain using a generalized shallow fluid approximation, 7:32477
Frey, N.D., *See* Jaske, C.E., 7:31986
Friedman, H.A., *See* Toth, L.M., 7:32241
Friedman, S.D., Applied aspects of cosmic ray investigation, 7:32440
Friese, G.J., *See* Hirasuna, A.R., 7:31894
Frindik, O., Supplement to the paper 'Transfer of plutonium, americium, and curium from ground to vegetation through plant roots', 7:32513 (INIS-mf—6902, pp v)
Froeschen, W., *See* Santosa, S., 7:32148
Frolov, A.M., *See* Maisheev, V.A., 7:32810
Frost, H.J., Recoil resolution and particle stability under irradiation, 7:32884 (DOE/ER/10107—11)
See Arnberg, L., 7:32140, 7:32881
Fry, F.A., *See* Campbell, G.W., 7:32823
Fryer, R.M., *See* Lambert, J.D.B., 7:32041
Fthenakis, V., Analysis of selected surface characteristics and latent heat storage for passive solar space heating, 7:31866 (BNL—30441)
Fuehr, F., Requirements for a practical assessment of transfer and concentration factors in plants, 7:32516 (INIS-mf—6902, pp v)
Transfer of the corrosion nuclides ^{59}Fe, ^{54}Mn, ^{65}Zn, and ^{60}Co from ground to

vegetation, 7:32514 (INIS-mf—6902, pp v)
Fujii, H., *See* Yoshino, K., 7:32721
Fujiwaka, S., Feedback controller of ultra high pressure gas, 7:32870 (IPPJ-DT—82)
Fulfaro, R., *See* Vasconcellos, M.B.A., 7:32193
Fumuro, F., Detection of heavy nuclei in the plastic track detector CR-39, 7:32686

G

Gabay, S., *See* Lavi, S., 7:32851
Gadjokov, V., Numerical generation of orthomonic polynomials of many variables, 7:32915 (JINR—E-11-80-782)
Gaeggeler, H., *See* Lougheed, R.W., 7:32348
See Wo Fan, 7:32189
Gaertner, M., *See* LaVake, J.C., 7:32014
Gaiser, H., *See* Malwitz, E., 7:32335
See Wilhelm, K., 7:32219
Gal, J., *See* Mintz, M.H., 7:32700
Galeao, A.P.N.R., Equations of motion for nuclear particle-particle excitations and the interacting boson model, 7:32788 (IFUSP-P—245)
Galford, J.E., *See* Au-Yang, M.K., 7:31932
Galkin, V.I., Comparison of Cerenkov radiation pulse shapes calculated regarding and disregarding thickness and curvature of shower front, 7:32652
Gallagher, W.R., *See* Duvel, W.A. Jr., 7:31727
Galli, G., Functional study with ^{131}I-Rose Bengal in chronic active hepatitis and nonactive cirrhosis using a three-compartment model, 7:32555
Galumyan, P.I., *See* Adamyan, F.V., 7:32370
See Arustamyan, G.V., 7:32371
Galvao, R.M.O., *See* do Nascimento, I.C., 7:32888
Gamson, N., *See* Sitzer, S., 7:32077
Gandyl, E.M., *See* Belyaev, V.B., 7:32706
Ganelin, G.Z., *See* Barnaulova, T.V., 7:32398
Gangrskii, Yu.P., Resonance scattering of 3-5 MeV γ-quanta emitted at radioactive decay, 7:32786 (JINR-R—15-81-151)
Gappisch, M., Influence of quality assurance on valve design and manufacture, 7:32261
Garde, R., *See* Harper, J.R., 7:31955
Garin, V.P., Semianalytical method of nonstationary thermal problem solution for a pipeline with an incompressible coolant, 7:31946 (IAE—3288/5)
Garner, M.Q., Correlation of long-term storage and accelerated stability tests, 7:31758
Garrigan, G.A., Technical assessment of the prevention of micro-fouling on OTEC heat-transfer surfaces through the use of ultraviolet radiation, 7:31865 (DOE/ET/21002—T21)
Gasper, A., *See* Kaspar, K., 7:32333
Gaudreau, M.P.J., Comparative study of fundamental and second-harmonic ICRF wave propagation and damping at high density in the Alcator tokamak, 7:32848 (DOE/ET/51013—27)
Gavrilenko, G.M., Fokker-Planck equation for the description of thermalization of beams of energetic charged particle channeled through a crystal, 7:32707 (JINR-R—17-80-814)
Gavrilov, V.B., *See* Bayukov, Yu.D., 7:32399
Gawin, J., *See* Dzikowski, T., 7:32660
Gawrisch, K., *See* Klose, G., 7:32843
Gazizov, A.Z., *See* Berezinski, V.S., 7:32436
Gear, C.W., Solving ordinary differential equations with discontinuities, 7:32930 (UIUCDCS-R—81-1064)
Gear, D.W., *See* Christensen, R.N., 7:31814
Gehrs, C.W., *See* Giddings, J.M., 7:32593
Geiling, D.W., Mechanical, thermal and hydraulic design of a monometallic water-cooled gas turbine nozzle, 7:31906
Geissel, H., Stopping power measurements with the modified UNILAC TOF-system, 7:32808 (GSI—81-2, pp 140)
Gembalies-Datz, D., *See* Trautmann, N., 7:32347
Geng, Q., *See* Liu, Z., 7:32435
Gentry, W.R., Reactions of ions with atomic and molecular free radicals. Progress report, May 1, 1981-April 30, 1982, 7:32693 (DOE/ER/02640—13)
George, T.L., *See* Khan, E.U., 7:31948
Gerasimov, S.N., Stabilization of a vertical instability by a feedback system at the T-12 installation, 7:32852 (IAE—3268/7)
Gerhard, A., Production and application of molecular filters, 7:32249 (GSI—81-2, pp 180)
Gerhardy, P.R., Size spectra and anisotropy measurements with the Buckland Park array, 7:32664
Gerstl, S.A.W., Reduction of photosynthetically active radiation under extreme stratospheric-aerosol loads, 7:32474 (LA-UR—81-3573)
Ghosh, B., *See* Ghoshdastidar, M.R., 7:32751
Ghosh, K.K., Synthesis of life related molecules in interstellar space, 7:32687
Ghosh, S.N., *See* Ghosh, K.K., 7:32687
Ghoshdastidar, M.R., Critical evaluation of the single particle inclusive cross sections used for describing particle production in high energy cosmic ray interactions, 7:32751
Giambiagi, M., *See* de Giambiagi, M.S., 7:32691
Gibraiel, S.A., *See* Ibrahim, Z.N., 7:32048
Gibson, A.I., Spatial characteristics of the muon component of large air showers, 7:32617
Giddings, J.M., Toxicity of a coal liquefaction product to aquatic organisms, 7:32593
Gilchriese, M.G.D., Recent results from CLEO, 7:32364 (SLAC—245, pp 403-426)
Giles, M.M., *See* Spore, J.W., 7:32043
Gillis, M., Severance taxes on coal and uranium in the sunbelt, 7:31745
Ginevan, M.E., *See* Carnes, B.A., 7:32569
See Collins, J.J., 7:32590
See Curtiss, J.R.B., 7:32570
Girrens, S.P., Numerical prediction of subsidence with coupled geomechanical-hydrological modeling, 7:32594 (LA-UR—81-3700)
Glaessel, P., *See* Walter, P. v., 7:32375
Glahe, E., Operating experience gained with slag tap furnaces, 7:32306
Glatt, I., Application of metal vapor lasers to Raman spectroscopy for flame diagnostics, 7:32699 (IA—1364, pp 81-82)
Gnatovskii, A.V., *See* Grantsev, V.I., 7:32416
Goettling, D.R., Measurement of local velocity in water with hot wire anemometers, 7:32279
Gogoleva, T.D., *See* Abdulakhatov, M.K., 7:31787
Goldhaber, M., Is the proton stable, 7:32736
Goldsberry, F.L., *See* Cawley, W.E., 7:31812
Goldsmith, S., *See* Newman, D.F., 7:31918
GoloVin, V.M., Light collection in large liquid scintillation counters with dacron foil wall, 7:32412 (JINR-R—13-81-74)
Goodyear, C.P., *See* Boreman, J., 7:32526
Goosen, D.J., *See* Dormehl, I.C., 7:32563
Gopal, S., Commercial 200-275°C hybrids, 7:31885 (SAND—82-0425, pp 59-64)
Gordon, D., *See* Fogelman, I., 7:32553
Gordon, R.S., Ceramics in high-performance batteries, 7:32068 (CONF-790526—3)
Fabrication and characterization of NASICON electrolytes, 7:32069 (CONF-8009134—2)
Gorshkov, V.A., *See* Ter-Akop'yan, G.M., 7:32411
Goswami, G.C., *See* Ghoshdastidar, M.R., 7:32751
Goulianos, K., *See* Chapin, T.J., 7:32369
Govorun, N.N., Program generation as a software maintenance in big program systems, 7:32409 (JINR-R—10-81-315)
Grabskii, V.O., *See* Arustamyan, G.V., 7:32371
Graef, H., Status of the NaI crystal ball project, 7:32382 (GSI—81-2, pp 190)
Grafoner, P., Simulation methods for systems analysis in electric power supply, 7:32101 (NP—2901089)
Graham, M.J., Radionuclide ground-water monitoring program for the separations area, Hanford Site, Washington State, 7:32534 (RHO-SA—216)
Results of the separations area ground-water monitoring network for 1980, 7:31807 (RHO-LD—165)
Grahn, D., *See* Collins, J.J., 7:32590
Grams, T., Safety and technical reliability, 7:32298
Grant, M.A., Computerised information system for the processing of borehole data with regard to uranium sources in the Republic of South Africa, 7:31785 (PER—61)
Grant, N.J., *See* Arnberg, L., 7:32881
See Harling, O.K., 7:32141
See Megusar, J., 7:32137, 7:32882
See Testart, E., 7:32139
Grantsev, V.I., Laser application for detector system adjustment in a

reaction chamber, 7:32416 (KIYI—80-8)
Grasmueck, B., *See* Wiemers, M., 7:32334
Grasselt, K.H., Technology assessment. Pt. 2, 7:32538
Gray, R.H., Assessing health and environmental effects of a developing fuel technology, 7:32536
Gray, S.J., *See* Halpenny, A.S., 7:31888
Gray, W.J., Volatility of some potential high-level radioactive waste forms, 7:31815
Green, P.J., Detailed examination of the electron lateral energy and density near the core of medium energy air showers, 7:32662
Greenberg, J., *See* Reivich, M., 7:32540
Greenland, P.T., Electron capture by highly stripped ions, 7:32689 (AERE-TP—876)
Rydberg atoms, 7:32688 (AERE-R—9986)
Gregory, A.G., *See* Gerhardy, P.R., 7:32664
See Liebing, D.F., 7:32636
Greulich, N., Separation of reaction products by vacuum thermochromatography, 7:32190 (GSI—81-2, pp 189)
Grieder, P.K.F., *See* Allkofer, O.C., 7:32431
Grier, B.H., Inelastic neutron scattering studies of single crystal TmSe, 7:32820
Griest, W.H., *See* Caton, J.E., 7:32530
Griffith, R.V., *See* Anderson, A.L., 7:32579
Grimaldi, M.G., Germanide formation by thermal treatment of platinum films deposited on single-crystal Ge<100> substrates, 7:32426
Grimm, F.A., *See* Carlson, T.A., 7:32713
Grimm, W., *See* Kutzner, J., 7:32564
Grisham, J., *See* Ogard, A., 7:32535
Grishina, N.V., Analysis of experimental data on EAS, 7:32614
Time delay distribution of high energy muons in the EAS, 7:32666
Grissom, M.C., Low-level radioactive wastes. A bibliography of additions to the Energy Data Base in 1981, 7:31793 (DOE/TIC—3387)
Grochalska, B., *See* Dzikowski, T., 7:32660
Groesch, H., *See* Malwitz, E., 7:32335
Groh, K.R., *See* Ehret, C.F., 7:32568
Gross, H., State of the art of standardization of reliability terminology, 7:32299
Gross, M.B., *See* Silling, S.A., 7:32054
Gross, R.A., *See* Tien, J.K., 7:32886
Grosser, W., High-temperature corrosion of ferritc chromium steels and austenitic chromium-nickel steels in atmospheres containing hydrogen sulphide, 7:32157 (NP—2901084)
Grosshandler, W.L., Characteristics of coal/light hydrocarbon slurries in spray combustion. Quarterly progress report, September 1, 1981-November 30, 1981, 7:31740 (DOE/PC/30216—T3)
Gruen, D.M., *See* Krauss, A.R., 7:32909
Guanehr, M., *See* Binon, F., 7:32392
Gudima, K.K., Cascade-exciton model of nuclear reactions. Model formulation, 7:32800 (JINR-R—2-80-774)
Guendel, H., Model for diffuse breakdown in high pressure gases with uniform electric fields strengths, 7:32270
Guenther, C., Numerical investigation of natural convection in a Hele-Shaw gap heated from below, 7:32272 (KFK—3142)
Guenzburger, D.J.R., Electronic structure and Moessbauer hyperfine interactions of Au (I) compounds, 7:32827 (CBPF-A—0022/80)
Guilliani, L., Usefulness of energy measurements in industrial applications of acoustic emission, 7:32288
Guo, K.J., Amorphous metal diffusion barriers, 7:31887 (SAND—82-0425, pp 137-146)
Gurewitz, E., Cobalt distribution in $LaNi_4Co$. A neutron diffraction study, 7:32209 (IA—1364, pp 103)
Crystallographic structure of LaNisub(4)CoDsub(y). A neutron diffraction study, 7:32210 (IA—1364, pp 103-104)
Polytypism in $KMnCl_3$. Neutron diffraction study of the distorted perovskite structure compound, 7:32208 (IA—1364, pp 101-103)
Polytypism in $RbMnCl_3$. Neutron diffraction study of the cubic perovskite structure compound, 7:32207 (IA—1364, pp 101)
Gurin, V.N., *See* Polivanskii, V.P., 7:31966
Gutbrod, H.H., *See* Baden, A., 7:32383
Guzik, Z., Units for output of graphical information on display in the "Crystal" experiment, 7:32450 (JINR—1-81-29)
Gvaladze, Yu.S., *See* Kvartskhava, I.F., 7:32878

H

Ha, C.W., Development of portable survey meter, 7:32415 (KAERI/RR—218/80)
Ha, Y.J., *See* Such, H.C., 7:31941
Haas, U., *See* Wieser, P., 7:32487
Habs, D., *See* Graef, H., 7:32382
Hadari, Z., *See* Mintz, M.H., 7:32700
Hadnagy, T.D., *See* Gordon, R.S., 7:32068
Haeuser, J., *See* Tanzer, F., 7:32328
Haeusser, O., *See* Graef, H., 7:32382
Hagan, J.W., *See* Baird, Q.L., 7:32036
Hageman, J.P., *See* Lamm, D.A., 7:32059
Haggmark, L.G., Monte Carlo calculations of light-ion sputtering as a function of the incident angle, 7:32716
See Bohdansky, J., 7:32167
Haire, R.G., *See* Musikas, C., 7:32242
Hajek, B.K., Ohio State University Reactor Sharing Program. Semi-annual technical report, September 1, 1980-April 30, 1981, 7:31998 (DOE/ER/10727—T1)
Halbig, J.K., *See* Phillips, J.R., 7:31820
Hale, G.M., Molybdenum and its analyses, 7:32132 (BDX—613-2730)
Halfmann, K., *See* Deitinghoff, H., 7:32320
Halle, H., Flow-induced tube vibration tests of typical industrial heat exchanger configurations, 7:32257
Halpenny, A.S., Development of a metal sheath cable, 7:31888 (SAND—82-0425, pp 165-174)
Halpern, I., *See* Drake, D.M., 7:32795
Halsey, W.G., *See* Hsieh, E.J., 7:31822
Halstead, G.W., *See* Eastman, M.P., 7:32239
Hamilton, D.J., *See* Kerwin, W.J., 7:31884
Hamilton, G.W., State of work on the AMBAL experiment, 7:32902 (UCID—19206)
Hamilton, M.S., Environmental, legal and political constraints on power plant siting in the southwestern United States. Special Series 16, 7:31911 (NP—2902471)
Hammal, H., *See* Albrecht, R., 7:32378
Hammen, M., Elastic scattering of monochromatic photons at the atomic nucleus of ^{208}Pb in and above the dipole giant resonance, 7:32789 (INIS-mf—6825)
Hancher, C.W., *See* Patton, B.D., 7:32527
Handl, J., I129 in the biocycle, 7:32510 (INIS-mf—6902, pp v)
Hanitsch, R., *See* Fengler, G., 7:31910
Hann, C.R., Transient deformation properties of Zircaloy for LOCA simulation. Final report, 7:32017 (EPRI-NP—526-Vol.4,Pt.2)
Hannan, P.J., *See* Neihof, R.A., 7:31762
Hansborough, L.D., Mechanical design of RFQ resonator cavities in the 400-MHz frequency range, 7:32325 (LA-UR—81-3057)
Hansen, L.J., High pressure-high temperature borehole fluid sampler, 7:31889 (SAND—82-0425, pp 175-176)
Hansen, P., Influence of nuclear tracks on ferromagnetic resonance linewidth of yttrium iron garnets, 7:32182 (GSI—81-2, pp 176)
Hara, T., Lateral distribution of muon in EAS, 7:32612
Muon size and muon fluctuation, 7:32613
Observation of Cerenkov light at the distance of more than 1Km from the EAS core, 7:32642
Size and density spectra of vertical and inclined showers at Akeno, 7:32627
Size dependence of various observables at Akeno, 7:32626
Harari, H., Composite quarks and leptons, 7:32759 (SLAC—245, pp 685-698)
Hardel, H., *See* Albrecht, R., 7:32378
Hardy, J.E., Advanced two-phase instrumentation program. Quarterly progress report, July-September 1981, 7:31929 (NUREG/CR—2204-Vol.3)
Harling, O.K., Application of high-strength copper alloys for a fusion-reactor first wall, 7:32141 (DOE/ER/10107—9)
See Arnberg, L., 7:32140, 7:32881
See Kanani, N., 7:32138
See Manahan, M.P., 7:32885
Harms, G.A., *See* Johnson, R.H., 7:32008
Harper, J.R., Decommissioning the Los Alamos Molten Plutonium Reactor Experiment (LAMPRE I), 7:31955 (LA—9052-MS)
Harrach, D. v., *See* Walter, P. v., 7:32375
Hartung, J.R., *See* Brunings, J.E., 7:32037
Hartung, M., *See* Strehl, P., 7:32336
Haschek, W.M., *See* Witschi, H., 7:32585

Hasinger, S.H., Self-supporting laser diffuser flow energizer, 7:32268
Hastings, J.M., *See* Zhuang, J., 7:32176
Hatano, Y., *See* Hara, T., 7:32612, 7:32613, 7:32626, 7:32627
Hatayama, A., Mixing length hypothesis in the dissipative trapped ion instability, 7:32864 (IPPJ—481)
Hatfield, R.W., *See* Dutta, P.K., 7:32458, 7:32459
Haussmann, W., *See* Fischer, F., 7:31790
Hayashida, N., *See* Hara, T., 7:32612, 7:32613, 7:32626, 7:32627, 7:32642
Haydt, H.M., Fabrication characteristics of Zircaloy tubes for nuclear reactors, 7:31978 (CNEN-DIN—01/80)
Hayes, R.W., Distributed resource management: deadlocks, 7:32913 (CONF-811214—6)
Hazard, H.R., *See* Anson, D., 7:31743
Hazen, E.S., *See* Hazen, W.E., 7:32670
Hazen, W.E., Measurements of electron densities in E.A.S. using spark chambers and thin scintillators, 7:32672
Spark chamber study of subcores at mountain altitude, 7:32670
Heard, F.E., High-temperature acoustic borehole televiewer, 7:31890 (SAND—82-0425, pp 177-184)
Heaton, R.C., Trace element characterization of coal wastes. Fifth annual progress report, October 1, 1979-September 30, 1980, 7:31728 (LA—8826-PR)
Hecht, A., Effects at the extension of short ultrasonoic pulses in scattering materials, 7:32290
Heeschen, W., Situation and analysis of residues in milk, 7:32499
Hege, H.R., Methods to avoid inadmissibly high final compression temperatures, 7:32258
Heger, R., *See* Kuefner, K., 7:31975
Heim, K., *See* Biesold, H., 7:32511
Heimann, R., *See* Trautmann, N., 7:32347
Hein, L.A., *See* Deshurko, M.D., 7:32608
Heine, P., Simulation of a two-cycle engine and optimization of its gas-dynamic parameters of influence by means of a direct research method, 7:32126 (NP—2901109)
Heineman, W.R., Development of more efficacious Tc-99m organ imaging agents for use in nuclear medicine by analytical characterization of radiopharmaceutical mixtures. Progress report, May 1, 1981-April 30, 1982, 7:32231 (DOE/EV/10380—2)
Heinrich, J., Influence of processing conditions on the microstructure and the mechanical properties of reaction sintered silicon nitride, 7:32169 (DFVLR-FB—79-32)
Heitmann, H., *See* Hansen, P., 7:32182
Helmstreit, W., *See* Brede, O., 7:32224
Hemolt, U. v., *See* Graef, H., 7:32382
Hendel, A.Z., *See* Hazen, W.E., 7:32670, 7:32672
Henry, C.N., Nuclear safeguards research and development. Program status report, October 1980-January 1981, 7:31819 (LA—8870-PR)
Henry, C.P., du Pont F21 149°C (300°F) accelerated stability test, 7:31757
See Stavinoha, L.L., 7:31755
Henslee, S.P., *See* Kelsey, P.V. Jr., 7:32880
Hermelee, A., Systems analysis of hydrogen supplementation in natural gas pipelines, 7:31771 (BNL—30440)
Hernandez, A.T., *See* Belov, A.G., 7:32196
Herr, W., *See* Thiel, K., 7:32181
Herrmann, W., Analysis of creep data for various natural rock salts, 7:32184 (SAND—81-2567)
Herzog, W., *See* Jonas, H., 7:32283
Hess, C.W., *See* Patti, F.J., 7:32039
Hesslewood, S.R., Quantity control procedures for sup(99m)Ic complexes, 7:32560
Heusch, C.A., Heavy flavor production from photons and hadrons, 7:32745 (SLAC—245, pp 195-259)
Heyng, H.W., *See* Graef, H., 7:32382
Hickmann, U., *See* Greulich, N., 7:32190
Hicks, H.R., *See* Holmes, J.A., 7:32875
Higaski, S., Correlation of the high energy muons with the size of the air showers associated, 7:32685
Hill, R.W., WIDCO mine coal face in-situ gasification test, 7:31720 (UCID—19280)
Hillas, A.M., Calculated time characteristics of Cerenkov pulses from air showers, 7:32655
Hillmann, H., *See* Best, K.J., 7:32844
Hinds, W.T., *See* Skalski, J.R., 7:32498
Hinnefeld, S.L., *See* Englert, J.P., 7:31797
Hippauf, K.H., Rehabilitation, reinforcement and safety of steel structures, 7:32295
Hirao, A., *See* Ogasawara, M., 7:32867
Hirasuna, A.R., High temperature Y267 EPDM elastomer field and laboratory experiences, August 1981, 7:31894 (SAND—82-0425, pp 149-158)
Hirdes, D., *See* Dersch, G., 7:32349
Hirdes, U., *See* Honig, G., 7:32918
Hirn, M.H., *See* Strambi, C., 7:32550
Hiskes, J.R., Model for H^-, D^- production by hydrogen backscattering form alkali and alkali/transition-metal surfaces, 7:32907
Hitzhusen, F.J., Economics of crop and forest biomass for energy, 7:31843 (NP—2901471)
Ho, J.H., *See* Kim, H.J., 7:32814
Hocking, G., Numerical prediction of basalt response for near-surface test facility heater tests No. 1 and No. 2, 7:31806 (RHO-BWI-C—86)
Hodgson, S.F., *See* Dosch, M.W., 7:31892
Hodson, A.L., *See* Hazen, W.E., 7:32672
See Porter, M.R., 7:32673
Hoeflich, H., *See* Best, K.J., 7:32844
Hoffert, M., Geochemical and geophysical models of the fossil-fuel CO_2 climate problem. Semiannual progress report, February 2, 1981-August 31, 1981, 7:32473 (DOE/EV/10610—01)
Hoffmann, G., Guidelines for sampling of soils and vegetation in order to determine contamination, radiation burden in the vicinity of nuclear power plants, seepage, and transfer factors of radionuclides, 7:32517 (INIS-mf—6902, pp v)
See Fuehr, F., 7:32516
Hoffmann, K.H., Trade unions present clear attitude concerning energy policy, 7:32079
Hofman, G.L., *See* Lambert, J.D.B., 7:32041
Hofmann, S., *See* Seah, M.P., 7:32291
Hofsommer, H.J., *See* Bielig, H.J., 7:32502
Holbach, H., Time-resolved uv spectroscopy on ammonia excited by a pulsed CO_2 laser, 7:32710 (PLF—31)
Holcombe, C.E., Composition for use in high-temperature hydrogen-fluorine environments and method for making the composition, 7:32175
Holden, T.M., *See* Buyers, W.J.L., 7:32819
Hollaender, A., History of attempts to quantify environmental mutagenesis, 7:32586 (BNL—30356)
Holland-Moritz, E., *See* Debray, D., 7:32165
Hollnagel, E., Simulator training analysis. A proposal for combined trainee debriefing and performance data collection, 7:31957 (RISO-M—2301)
Hollowell, K., *See* Patterson, D.O., 7:32457
Holman, W.E., *See* Levi, M.P., 7:32122
Holmes, J.A., Finite-beta effects on the nonlinear evolution of the (m = 1;n = 1) mode in tokamaks, 7:32875 (ORNL/TM—8063)
Holmes, N.C., High energy laser facilities at Lawrence Livermore National Laboratory, 7:32904 (UCRL—87038)
Holroyd, R.A., Dependence of conduction band energy and electron mobility on fluid density, 7:32226
Holstein, W.L., Hydrogenolysis of carbon and its catalysis by platinum, 7:31722
Holzschuh, G., Parmila-GSI - a computer program for beam dynamics in accelerators with space charge, 7:32324 (GSI—81-2, pp 267)
Honea, F.I., *See* Anson, D., 7:31743
Honig, G., Application of an efficient algorithm for the numerical Laplace inversion, 7:32918 (Juel—1672)
Hopke, P.K., Application of factor analysis to urban aerosol source resolution, 7:32490
Horn, W., *See* Sugama, T., 7:32177
Hornbacher, D.D., *See* Barker, C.J., 7:32505
Horneff, H., *See* Strehl, P., 7:32336
Hornstra, F., *See* Swoboda, C.A., 7:32127
Horowitz, A., *See* Gurewitz, E., 7:32207, 7:32208
Horton, L., *See* Bray, A.D., 7:32615
Hosford, C.D., Sputter coating of microspherical substrates by levitation, 7:31823
Hoving, J., Carcinoma in hyperfunctioning thyroid nodule in recurrent hyperthyroidism, 7:32559
Hower, J.C., *See* Lloyd, W.G., 7:31726
Hsieh, E.J., Magnetron co-sputtering system for coating ICF targets, 7:31822 (UCRL—86160)
Huang, H.M., *See* Wen, C.Y., 7:31716
Huang, T., *See* Brodsky, S.J., 7:32756
Huber, G., In-beam laser fluorescence spectroscopy, 7:32385 (GSI—81-2, pp 198)
Huber, H.D., *See* Reilly, R.W., 7:32067
Huber, O., *See* Schmid-Albrecht, M., 7:32520
Huebner, F.W., Limiting factors in the calculation of depletion under creep stress conditions, 7:31908

Huevel, B., Calculation of the flow in axial-flow compressors by means of a 2-dimensional method, considering the flow in the side-wall boundary layer and the secondary flow, 7:32277 (NP—2901095)
Huff, G.A. Jr., *See* Satterfield, C.N., 7:31826
Hughes, N.R., Qualification of induction heating stress improvement for mitigation of stress corrosion cracking, 7:32047
Huh, Y.H., *See* Kim, S.K., 7:32198
Huizenga, H., Focal plane camera for celestial XUV sources, 7:32397 (INIS-mf—6833)
Hulbert, G., Comparison of LMFBR piping response obtained using response spectra and time history methods, 7:32049
Hulet, E.K., Chemical properties of the heavier actinides and transactinides, 7:32237 (UCRL—85944)
See David, F., 7:32243
See Lougheed, R.W., 7:32348
Humenick, M.J., *See* Bommer, P.M., 7:31783
Hundeshagen, *See* Creutzig, H., 7:32562
Hunt, D.N., EPROM-based LSI-11 for distributed instrumentation control, 7:32929 (UCRL—86500)
Huppert, P., *See* Clark, G.C., 7:31779
Hurn, E.J., Primary loop heat exchanger for HTGR plant residual heat removal and auxiliary cooling system, 7:32040
Hurt, S.S., Bulk shielding facility quarterly report, July, August, and September 1980, 7:32004 (ORNL/TM—7841)
Hurt, S.S. III, Bulk Shielding Facility. Quarterly report, October-December 1980, 7:32005 (ORNL/TM—7978)
Bulk Shielding Facility quarterly report, April, May, and June 1981, 7:32007 (ORNL/TM—8029)
Oak Ridge research reactor. Quarterly report, January, February, and March 1981, 7:32006 (ORNL/TM—7979)
Hussein, M.S., *See* Acquadro, J.C., 7:32769
See de Toledo, A.S., 7:32768
Hutter, G., Parasitic oscillations and their suppression in the Alvarez final radio-frequency amplifiers, 7:32330 (GSI—81-2, pp 243)
Hwang, J.Y., Data analysis and analytical predictions of a steam generator tube bundle flow field for verification of 2-D T/H computer code, 7:31949
Hwang, W.K., Survey of nuclear fusion technology. A prospect analysis of tokamak fusion research, 7:32897 (KAERI/RR—275/80)

I

Ibrahim, Z.N., Evaluation of dynamic load combination fatigue damage, 7:32048
Ichikawa, Y.H., New series of integrable nonlinear evolution equations, 7:32866 (IPPJ—484)
Ihara, H., PROFP-Y: a computer code for producing nuclear data library of fission products, 7:32776 (JAERI-M—9714)
Ihara, R., *See* Fumuro, F., 7:32686
Iida, H., *See* Kunori, S., 7:32782
See Toba, Y., 7:32791
Ikeda, H., KEK: $(UT)^2$ experiment on proton decay, 7:32734
Ikuta, K., Relaxed condition for purely ohmic ignition in reversed field pinch configurations, 7:32891 (IPPJ—472)
Ilenburg, R., *See* Baranov, V.A., 7:32404
Illert, K., *See* Malwitz, E., 7:32335
Imai, K., *See* Takatsu, H., 7:32896
Imeson, D., *See* Arnberg, L., 7:32881
Inoue, N., Atmospheric Cerenkov light from air showers above 10^{15} eV observed at 900m above sea level, 7:32640
Atmospheric Cerenkov light from large air showers observed at 5200m above sea level, 7:32641
See Kakimoto, F., 7:32629
See Tamura, T., 7:32619
Inuishi, Y., *See* Yoshino, K., 7:32721
Irgaziev, B.F., *See* Belyaev, V.B., 7:32706
Irish, G.E., Stability of diesel fuels made from shale oil, 7:31775
Irodova, A.V., Orientation ordering (anti k=0) in interstitial solid solutions on the base of cubic (C-15) Laves phases, 7:32833 (IAE—3308/9)
Isakova, L.Ya., Computer code for calculating reactor core optimal physical performances. POISK-2, 7:31965 (FEI—1110)
Ishida, M., Study on lethal effect on cells by determination of ^{10}B in biological tissues and (n, α) reaction. Quantitative determination of ^{10}B in biological tissues by soiled state track detection, 7:32571 (KURRI-TR—195, pp 87-91)
Ishiguro, M., Parallel computation for neutron diffusion equation, 7:31972 (JAERI-M—9235)
Ishihara, A., *See* Loos, U., 7:32561
Itakura, M., *See* Ohira, F., 7:32718
Itikawa, Y., Proceedings of the Nagoya seminar on atomic processes in fusion plasmas, 7:32702 (IPPJ-AM—13)
See Kaneko, Y., 7:32703
Ivanenko, I.P., *See* Galkin, V.I., 7:32652
Ivanov, A.A., *See* Dyakonov, M.N., 7:32634
Ivanov, V.G., *See* Badalyan, S.G., 7:32410
See Govorun, N.N., 7:32409
Ivanov, V.I., Problems on dosimetry and radiation protection. No. 19, 7:32822 (INIS-SU—39)

J

Jablonka, A., *See* Rajewska, A., 7:32840
Jackman, J.A., *See* Buyers, W.J.L., 7:32819
Jackson, S.A., Evaluation of image processing and presentation methods in thallium-201 myocardial scintigraphy, 7:32557
Jackson, S.V., *See* Krupka, M.C., 7:32130
Jacobstein, J.G., *See* Valdez, V.A., 7:32552
Jacq, J., *See* Rojey, A., 7:32118
Jaeschke, E., *See* Graef, H., 7:32382
Jakob, C.H., *See* Ketchum, R.G., 7:32281
Jameson, G.T., *See* Hsieh, E.J., 7:31822
Jaske, C.E., Long-life fatigue of type 316 stainless steel of temperatures up to 593 C, 7:31986
Jellinek, J., Classical reactive infinite order sudden approximation. Theory, 7:32698 (IA—1364, pp 9-10)
Jenne, E.A., *See* Deutsch, W.J., 7:32602
Jeon, B.C., *See* Kim, H.J., 7:32814
Jerger, D.E., *See* Chynoweth, D.P., 7:31836
Jiminez, A., *See* Lloyd, W.G., 7:31726
Jirak, G.T., Snubber design applications, 7:31934
Jockel, W., Apparatus for measuring chloride emissions from refuse incineration, 7:32465
Jogo, N., Monte Carlo calculation of Cerenkov light from the extensive air shower, 7:32654
See Hara, T., 7:32642
Johansson, A., *See* Collen, J., 7:32025
Johnson, E.E., *See* Dietrich, W.C., 7:32161
Johnson, R.H., Fission rates and ^{238}U capture rates for loading 1 of the Fast Breeder Blanket Facility, 7:32008 (PNE—81-150)
Jokisch, H., *See* Boehm, E., 7:32433
Jolley, R.L., Aqueous chemistry of chlorine: chemistry, analysis, and environmental fate of reactive oxidant species, 7:32528 (ORNL/TM—7788)
Joly, S., *See* Drake, D.M., 7:32795
Jonas, H., Sound monitoring for detection of pipe ruptures, 7:32283 (Juel-Spez—88)
Jones, M.M., *See* Heaton, R.C., 7:31728
Jones, R.H., Flow and fracture in the fusion environment, 7:32158 (PNL-SA—9759)
Jones, T.M., *See* Lloyd, W.G., 7:31726
Jordaan, J.H., *See* Dormehl, I.C., 7:32563
Joubert, J.I., *See* Pan, Y.S., 7:31742
Jung, V., Progress report of the Teilinstitut Nukleare Festkoerperphysik of the Institut fuer Angewandte Kernphysik from June 1st, 1979 to May 31st, 1980, 7:32764 (KFK—3051)
Junior, P., *See* Deitinghoff, H., 7:32320
Junk, H., Influence of new technologies in wireline logging on the profitability of drilling projects, 7:32601
Jurgens, R.F., High temperature electronics in space applications, 7:32455 (SAND—82-0425, pp 85-90)

K

Kaeferstein, F.K., Exposure to heavy metals from foods, 7:32500
Kaffrell, A.K., *See* Trautmann, N., 7:32347
Kaganov, L.I., *See* Diminstein, O.S., 7:32624
Kahharov, M.K., *See* Khristiansen, G.B., 7:32637, 7:32638
Kahn, R., *See* Debray, D., 7:32165
Kairento, A.L., Use of hormone receptors in scintigraphy of the ovaries, 7:32556
Kaiser, R., *See* Malwitz, E., 7:32335
Kaizaki, I., *See* Yoshino, K., 7:32721
Kajino, F., *See* Higaski, S., 7:32685
Kakimoto, F., Character of nuclear interactions and composition of

primary cosmic rays at 10^{15}eV to 10^{20}eV deduced from air showers observed at 5200m and 900m above sea level, 7:32629
See Inoue, N., 7:32640, 7:32641
Kalantarov, K.D., *See* Zanevskii, Yu.V., 7:32413
Kalhammer, F.R., Integrating new sources into utility systems, 7:32102
Kalinichenko, B.S., *See* Dedov, V.B., 7:32191
Kalinin, V.V., *See* Likhachev, Yu.I., 7:31936
Kalinina, G.V., *See* Avdeev, N.F., 7:32400
Kallio, N.N., *See* Stieber, A., 7:31759
Kalmykov, N.N., Shape of EAS cascade curve at $E_0 > 10^{17}$eV, 7:32646
See Grishina, N.V., 7:32666
See Khristiansen, G.B., 7:32637, 7:32638
Kameda, T., *See* Asakimori, K., 7:32677
Kamimura, T., *See* Makino, M., 7:32863
See Ohsawa, Y., 7:32861
See Tanaka, M., 7:32869
Kan, Y.W., *See* Carrano, A.V., 7:32544
Kanani, N., Pre-irradiation spatial distribution and stability of boride particles in rapidly solidified boron-doped stainless steels, 7:32138 (DOE/ER/10107—4)
Kanazirski, Kh.M., *See* Deenski, P.A., 7:32725
Kaneko, Y., Cross sections for charge transfer collisions involving hydrogen atoms, 7:32703 (IPPJ-AM—15)
Kang, H.D., *See* Chung, M.K., 7:31925
Kang, S.C., *See* Lee, Y.P., 7:32453
Kang, Y.H., Manufacturing process of UO_2 pellets, 7:31939 (KAERI/RR—236/80)
Kankeleit, E., Tori spectrometer, a new instrument for positron- and electronspectroscopy, 7:32384 (GSI—81-2, pp 195)
Kapusta, J., Global analysis of relativistic heavy-ion collisions, 7:32803
Karamyan, S.A., *See* Bugrov, V.N., 7:32794
Karliner, I., Free quark search at PEP, 7:32749 (SLAC—245, pp 603-619)
Karlov, A.A., SING-dialoque subsystem for graphical representation of one-dimensional array contents, 7:32917 (JINR-R—11-12133)
Karlsson, B.O., Multi state simulation model of the maintenance for a power generating station, 7:31904 (SV-FUD—4-2)
Karonen, S.L., *See* Kairento, A.L., 7:32556
Karpov, E.S., Influence of the grain size on the characteristics of high-temperature plastic deformation of beryllium, 7:32155 (KFTI—81-15)
Karwat, H., State of pressure suppression containment research in the Federal Republic of Germany, 7:32019 (GKSS—81/E/27, pp I 3-21)
Kasai, M., *See* Tone, T., 7:32872
Kasche, V., *See* Zipfel, P.F., 7:32546
Kashcheev, V.M., Droplet size effect on heat and mass transfer characteristics of two-phase flow in a post-CHF boiling regime. Results of a numerical experiment, 7:31982 (FEI—1128)
Kaspar, K., Measurements on the ferrite rings for the SIS prototype-cavity, 7:32333 (GSI—81-2, pp 256)
On-line control of ferrite measurements performed by a desktop computer, 7:32342 (GSI—81-2, pp 257)
See Blasche, K., 7:32317
See Emmerling, M., 7:32343
Kato, T., *See* Itikawa, Y., 7:32702
Kauppinen, J., Simple method for single-frequency operation and stabilization of a He-Ne laser, 7:32267
Kawakami, S., *See* Miyake, S., 7:32658
Kazakova, T.Yu., *See* Shcherbakov, S.I., 7:31979
Kazanas, D., Monte Carlo study of neutrino acceleration in supernova shocks, 7:32684
Keeney, R.L., Decision framework for technology choice. Volume 1. A case study of one utility's coal-nuclear choice, 7:32098 (EPRI-EA—2153-Vol.1)
Keesee, R.G., *See* Castleman, A.W. Jr., 7:32489
Keller, R., High current ion sources development, 7:32345 (GSI—81-2, pp 263)
See Klabunde, J., 7:32319
Kelsey, P.V. Jr., Preliminary evaluation of beta-spodumene as a fusion reactor structural material, 7:32880 (CONF-810831—80)
Kent, S.P., Antibody coated gold particles containing radioactive gold in the demonstration of cell surface molecules, 7:32543
Keodin, O.P., *See* Rochev, V.Ya., 7:32842
Keough, D.D., *See* McHugh, S.L., 7:31769, 7:31770
Kerwin, W.J., High temperature magnetometer feasibility study, 7:31884 (SAND—82-0425, pp 51-56)
Ketchum, R.G., Methods to calculate equilibrium tray, 7:32281
Khan, E.U., Validation study of COBRA-WC for LMFBR steady-state and transient analysis, 7:31948 (PNL-SA—9441)
Kharisov, I.F., *See* Gangrskii, Yu.P., 7:32786
Khizhnyak, N.A., *See* Lymar, A.G., 7:32353
Khlopkin, A.N., *See* Belyaev, V.A., 7:32765
Khmelevskii, M.Ya., *See* Likhachev, Yu.I., 7:31936
Kho Den Gi, *See* Belov, A.G., 7:32196
Khristiansen, G.B., Experimental data on the lateral distribution of Cerenkov radiation from EAS, 7:32638
Measurements of the Cerenkov light pulse duration at the Samarkand State University EAS array, 7:32637
X-ray photons in extensive air showers, 7:32656
See Diminstein, O.S., 7:32624
Kidnay, A.J., *See* Yesavage, V.F., 7:31725
Kiesewetter, H., *See* Malwitz, E., 7:32335
Kikuchi, A., *See* Sataka, M., 7:32704
Kikuchi, Y., *See* Oka, Y., 7:32770
Kim, B.G., *See* Kang, Y.H., 7:31939
Kim, C.S., *See* Ha, C.W., 7:32415
Kim, E.G., *See* Lee, B.K., 7:31995
Kim, E.S., *See* Koh, B.J., 7:31997
Kim, H.J., Study of material science by neutron scattering, 7:32814 (KAERI/RR—267/80)
Kim, H.S., *See* Such, H.C., 7:31941
Kim, J.D., Update and benchmark test of the LEOPARD library from ENDF/B-IV, 7:31974 (KAERI/RR—201/80)
Kim, J.J., *See* Lee, Y.W., 7:32032
Kim, J.S., *See* Lee, C.K., 7:31923
See Lee, J.B., 7:31924
Kim, N.B., *See* Yang, K.R., 7:32199
Kim, S.K., Study on the radioisotope-identification, 7:32198 (KAERI/RR—244/80)
Kim, T.S., *See* Suh, D.W., 7:31786
Kim, Y.J., *See* Lee, J.B., 7:31924
Kim, Y.M., *See* Nahm, K.J., 7:31940
Kinard, W.F., Crown ethers as size-selective synergists in solvent extraction systems: a new selectivity parameter, 7:32218
King, H.G. Jr., *See* Smyrl, N.R., 7:32204
King, W.J., *See* Vukovich, F.M., 7:31897
Kinney, C.L., *See* Severud, L.K., 7:32010
Kinoshita, K., Multihadron production in hadronic, leptonic and nuclear reactions at high energies, 7:32740 (KEK—79-33, pp 141-210)
Kirchner, F.R., Biological monitoring of fluidized bed coal combustion operations. II. Mammalian responses following exposure to gaseous effluents, 7:32591
See Kubitschek, H.E., 7:32592
Kirilov, A.S., *See* Karlov, A.A., 7:32917
Kirilyuk, A.I., *See* Andrzejewski, J., 7:32779
Kirk, B.L., *See* Boreman, J., 7:32526
Kirk, P.N., Experiments using the TASS and HISS spectrometers at the Bevalac. Annual progress report, April 1, 1981-March 31, 1982, 7:32604 (DOE/ER/04699—7)
Kirk, T.B., Pion production of chi mesons, 7:32746 (SLAC—245, pp 427-439)
Kitamura, T., Fluorescent light detector in Dumand, 7:32428
Kitipova, V., Probability of E1-transition taking into account anharmonicity for ^{176}Hf in neutron binding energy range, 7:32785 (JINR-R—4-81-243)
Klabunde, C.E., *See* Coltman, R.R. Jr., 7:32163
Klabunde, J., High current experiments in the Wideroee structure, 7:32319 (GSI—81-2, pp 264)
See Angert, N., 7:32315
See Geissel, H., 7:32808
See Holzschuh, G., 7:32324
Klabunde, K.J., *See* Matsuo, K., 7:32205
Klein, H., *See* Deitinghoff, H., 7:32320
See Gerhard, A., 7:32249
Klein, H.J., Solar energy-utilization from the consumers' point of view. Report on a project to determine innovation trends and barriers, 7:31870 (NP—2900958)
Kleinhorst, H., Emissions and immissions of environmentally relevant trace elements, 7:32486
Kleinman, L., *See* Antoniewicz, P.R., 7:32829
Klemme, D.E., *See* Neihof, R.A., 7:31762
Klepeis, J.E., *See* Sullivan, L.D., 7:32107
Klepper, O., *See* Huber, G., 7:32385
Klingler, L.M., Mound cyclone incinerator. Volume I. Description and performance, 7:31796 (MLM-MU—81-72-0003-Vol.1)
Klose, G., Lyotropic mesophases studied by ^{31}P-NMR, 7:32843
Klosterbuer, S.F., *See* Phillips, J.R., 7:31820
Kmiec, R.J., *See* Swoboda, C.A., 7:32127

Knickle, H.N., Study of multiphase flow useful to understanding scaleup of coal-liquefaction reactors. Technical progress report, September 1, 1981-November 30, 1981, 7:31717 (DOE/PC/40797—1)
Knight, R.G., *See* Duvel, W.A. Jr., 7:31727
Knurenko, S.P., *See* Dyakonov, M.N., 7:32634, 7:32645
Knyazyan, S.G., *See* Bayatyan, G.L., 7:32805
Kobayashi, M., Flavor dynamics, 7:32753 (KEK—79-33, pp 42-73)
Kobzarev, K.K., *See* Avdeev, N.F., 7:32400
Kobzev, A.P., Some peculiarities of the Vavilov-Cherenkov radiation connected with the finite thickness of the radiator, 7:32813 (JINR-R—14-80-793)
Koch, H., *See* Eichler, H.J., 7:32269
Kochurov, B.P., Test calculations of physical parameters of the TRX,BETTIS and MIT critical assemblies according to the TRIFON program, 7:31971 (ITEF—164(1980))
Koehler, R., *See* Kankeleit, E., 7:32384
Koehler, W., *See* Drescher, G., 7:32278
Koenig, L.A., Tritium uptake by plants, 7:32506 (INIS-mf—6902, pp v)
Koerfer, M., *See* Arlt, U., 7:32388
Koethe, H.K., Development of a modularized battery, 7:32070 (NP—2901049)
Koevesi-Domokos, S., *See* Domokos, G., 7:32722, 7:32738
Koh, B.J., Study for standardization of nuclear power plant control panels, 7:31997 (KAERI/RR—224/80)
Koh, B.R., *See* Such, H.C., 7:31941
Kollier, B., Transfer matrix treatment for linear chains with long range interactions, 7:32838 (PUC-tn—17/80)
See Mariz, A.M., 7:32159
Kolarz, C.R., *See* Duvel, W.A. Jr., 7:31727
Kolb, B., *See* Graef, H., 7:32382
Kolb, E.W., Early Universe, 7:32607
Kolb, M., Modal analysis of the GKSS-PSS-wet well, 7:32028 (GKSS—81/E/27, pp II 83-103)
Kollatz, M., *See* Kankeleit, E., 7:32384
Kolodziej, M., *See* Moeller, R., 7:31947
Kolomeets, E.V., *See* Friedman, S.D., 7:32440
Komarov, V.L., Generation of tubular beams of negative hydrogen ions by a surface plasma source, 7:32899 (NIIEFA-P-K—0488)
Komochkov, M.M., Dependence of LiF thermoluminescent detector response positioned behind different absorbers on energy of gamma radiation, 7:32414 (JINR-R—16-81-330)
Konno, K., *See* Ichikawa, Y.H., 7:32866
Konrad, F., *See* Loos, U., 7:32561
Kopf, U., *See* Malwitz, E., 7:32335
Korchagin, V.B., *See* Dadykin, V.L., 7:32439
Kordesch, K.V., Survey of carbon and its role in phosphoric-acid fuel cells. Final report, 7:32108 (BNL—51418)
Korenchenko, S.M., *See* Baranov, V.A., 7:32404
Korallov, V.A., *See* Grantsev, V.I., 7:32416
Korobchenko, M.L., *See* Vagov, V.A., 7:32001
Koroleva, L.I., *See* Bystritskaya, E.V., 7:32401
Koshi, Y., *See* Hatayama, A., 7:32864
See Ishiguro, M., 7:31972
Koshkarev, D.G., Charge-exchange method of heavy ion storage for inertial thermonuclear synthesis, 7:32893 (ITEF—12(1981))
Koslewicz, C.E., *See* Wray, W.O., 7:31869
Kotov, V.M., *See* Abdurakhimov, A.U., 7:32402
Kovach, L., *See* Holcombe, C.E., 7:32175
Kozhin, A.S., *See* Bozhko, N.I., 7:32396
Kozlov, F.A., Electrochemical cell for measuring oxygen activity in liquid sodium, 7:31945 (FEI—1061)
Kozlov, V.I., *See* Dyakonov, M.N., 7:32645
Kozlova, E.P., *See* Vagov, V.A., 7:32001
Krabbe, U., *See* Andersen, P.S., 7:31900
Kraft, O.E., *See* Bykov, A.A., 7:32771
Kramer, M., *See* Girrens, S.P., 7:32594
Krasniak, S.R., Preparation and characterization of β-D-glucosidase immobilized in calcium alginate, 7:31848 (ORNL/MIT—336)
Kratz, J.V., *See* Lougheed, R.W., 7:32348
Kraus, H., *See* Malwitz, E., 7:32335
Krauss, A.R., Suppression of sputter-induced erosion rate from alkali covered metal surface, 7:32909
Krejcik, P., HOBILAC - a high-current accelerator system, 7:32321 (GSI—81-2, pp 266)
See Fischer, B.E., 7:32386
Kreyling, G., *See* Arlt, U., 7:32388
Krieg, R., Analysis of fluid-structure interaction in pressure suppression systems type 69 during steam condensation, 7:32026 (GKSS—81/E/27, pp II 49-58)
See Kankeleit, E., 7:32384
Krieger, H., *See* Graef, H., 7:32382
Krishna, C.R., Atomization characteristics of coal slurries. First quarterly report, September 1-November 30, 1981, 7:31739 (DOE/TIC—2006853)
Kristiansen, G.B., Lateral electron distribution in EAS of different sizes, 7:32622
Kritzer, A., *See* Bourgeois, W., 7:32329
Krmpotic, F., Charge-exchange Gamow-Teller and dipole resonances in ^{90}Zr, 7:32773 (IFUSP-P—225)
Energy splitting between the $T=T_0$ and $T=T_0$-1 components of the charge-exchange vector dipole resonance, 7:32774 (IFUSP-P—246)
Kroo, N., *See* Pepy, G., 7:32841
Kruger, P.J., In vivo measurement of uranium in the human chest under high background conditions, 7:32419 (PEL—275)
Krupka, K.M., *See* Deutsch, W.J., 7:32602
Krupka, M.C., Impact of flywheel-energy-storage technology upon taxicab fleet operation in a large metropolitan city, 7:32130 (LA-UR—81-3071)
Krys, E., *See* Chudakov, A.E., 7:32676
Kryukova, L.M., *See* Baranchuk, M.K., 7:32452
Kubitschek, H.E., Biological monitoring of fludized bed coal combustion operations. I. Increased mutagenicity during periods of incomplete combustion, 7:32592
Kubono, S., Phenomenological optical potentials of heavy ions, 7:32775 (INS—398)
Kubota, H., *See* Caton, J.E., 7:32530
Kudo, H., *See* Takita, K., 7:32717
Kuefner, K., DIAMANT 2: a multigroup neutron-transport program for triangular and hexagonal geometry, 7:31975 (ORNL-tr—4797)
Kuehl, T., *See* Huber, G., 7:32385
Kuehn, W., *See* Handl, J., 7:32510
Kuhl, L.V., *See* Smith, L.F., 7:32605
Kuhlmann, J.D., Lateral distribution of atmospheric Cerenkov light, 7:32639
Kukacka, L.E., *See* Sugama, T., 7:32177
Kukharkin, N.E., *See* Garin, V.P., 7:31946
Kukita, Y., Full-Scale Mark II CRT program data report No. 10 (TEST 1203), 7:32030 (JAERI-M—9403)
Full-Scale Mark II CRT program data report No. 11 (TEST 1204), 7:32031 (JAERI-M—9404)
State of JAERI Full-Scale Mark II CRT Program, 7:32020 (GKSS—81/E/27, pp I 23-42)
Kul'kina, L.P., *See* Belov, A.G., 7:32196
Kulacki, F.A., *See* Christensen, R.N., 7:31814
Kulikov, G.V., *See* Khristiansen, G.B., 7:32656
See Kristiansen, G.B., 7:32622
Kumakura, M., Thermal ion-molecule reactions in oxygen-containing molecules, 7:32216 (JAERI-M—9336)
Kumar, K.D., *See* Boreman, J., 7:32526
Kung, H.H., Catalytic behavior of a cation in a solid solution: an electrostatic potential approach, 7:32220
Kunori, S., Direct experimental evidence for strong sequential two-step transfer process in allowed (p,t) reactions, 7:32782 (UTTAC—38)
See Toba, Y., 7:32791
Kutschera, S., Trends of development in opencast mining at increased diesel prices, 7:32308
Kutzner, J., Distribution in rats after intravenous injection of ^{88}Y compounds, 7:32564
Kuznetsov, Eh.K., *See* Kozlov, F.A., 7:31945
Kuznetsov, V.F., Algorithm and computer code for calculating the swelling of the fuel elements with a ceramic fuel, 7:31992 (IAE—3275/5)
Kvaratskheli, A.Yu., Quadratic approximation of the Payerls equation solution for multilayer cylinder. MKO program, 7:31970 (ITEF—162(1980))
Kvartskhava, I.F., Effect of metallic diaphragms on discharge evolution in a zet-pinch, 7:32878 (SFTI—10)

L

La, S.H., *See* Kang, Y.H., 7:31939
Laage, N.J., *See* Dormehl, I.C., 7:32563
Lai, K.F., Lateral distribution of electron-photon component in large cosmic ray showers, 7:32630
Laichter, Y., *See* Geissel, H., 7:32808
Laiken, R.M., *See* Wever, G.H., 7:32565

Laletin, N.I., Derivation of the finite difference equations for a heterogeneous reactor. 1. Square lattice blocks, 7:31968 (IAE—3280/5)
Lambert, J.D.B., Operational safety and reliability research at EBR-II, 7:32041
Lamers, H.J.G.L.M., Dependence of mass loss on the basic stellar parameters, 7:32680
Lamm, D.A., Summary of ASME Section XI pump and valve testing program for nuclear power plants and an assessment of its effect on plant availability, 7:32059
Lance, E.D., *See* Hurt, S.S., 7:32004
See Hurt, S.S. III, 7:32005, 7:32006, 7:32007
Landingham, R.L., *See* Lougheed, R.W., 7:32348
Landrum, J.H., *See* David, F., 7:32243
Langacker, P., *See* Goldhaber, M., 7:32736
Langbein, K., *See* Deitinghoff, H., 7:32320
Lange, F., ACTH measurement in the hypophysis after adrenalectomy and adrenal cortex hormone therapy by means of microphotometry and radioimmunoassay method, 7:32551
Lange, R., Modeling a multiple tracer release experiment during nocturnal drainage flow in complex terrain, 7:32491
Langenbeck, B., Pulsed magnetic beam shifter for an emittance measurement equipment, 7:32350 (GSI—81-2, pp 245)
See Blasche, K., 7:32317
See Breitenberger, G., 7:32341
Langer, G., *See* Bohatka, S., 7:32485
Langrok, Eh., *See* Chosnovska, V., 7:32195
Lantsov, M.N., Some problems of the neutron flux increase in a fast research reactor, 7:32000 (FEI—1069)
Lapchik, Eh.D., *See* Baranchuk, M.K., 7:32452
Lappi, R.L., Cross-ridge mountaintop mining. Subphase III-X. Technical progress report, June 1, 1979-January 31, 1980, 7:31732 (DOE/ET/13354—T1)
Larsen, I.I., *See* Olsen, C.R., 7:32522
Larson, D.E., High-level waste immobilization program. Quarterly report, October-December 1979, 7:31800 (PNL-SA—8408)
LaSalle, F.R., *See* Clark, G.L., 7:32063
Lauson, H.S., *See* Herrmann, W., 7:32184
LaVake, J.C., High burnup PWR ramp test program. First semi-annual progress report, October 1980-March 1981, 7:32014 (DOE/ET/34030—1)
Lavi, S., Self-calibrating technique for beam divergence measurements of CW and pulsed lasers, 7:32851 (IA—1364, pp 83)
Law, C.K., Theoretical studies on heterogeneous combustion. Progress report, March 1, 1981-December 15, 1981, 7:32246 (DOE/ER/04433—5)
Lawaetz, H., Incident solar radiation and solar heating systems -measured and calculated, 7:31867 (DTH-LV-MEDD—106)
Lawrence, C., International cooperation in energy R & D, 7:32087
Lawrence, F.O., *See* Vine, E.N., 7:32523
Layne, R.P., *See* Boyle, J.F., 7:31760
Lazareva, G.A., *See* Belyaev, V.A., 7:32765
le Duff, J., Design constraints and limitations in e^+e^- storage rings, 7:32363 (SLAC—245, pp 261-312)
Learned, J., *See* Andrews, J., 7:32430
Lebedev, A.P., *See* Grishina, N.V., 7:32614
Lebey, J., Progressive buckling. First series of experiments, 7:31977 (CEA-N—2213)
LeBlanc, J.M., *See* Alonso, C.T., 7:32606
Lebo, R.V., *See* Carrano, A.V., 7:32544
Lee, B.K., Analysis for post irradiation examination: pt. 1, 7:31995 (KAERI/RR—247/80)
Lee, C.K., Nuclear design and analysis for PWR, 7:31923 (KAERI/RR—223/80)
See Lee, J.B., 7:31924
Lee, C.Y., *See* Kim, H.J., 7:32814
Lee, D.K., Magnetic field, vector potential, and their partial derivatives due to a current-carrying straight wire of finite length, 7:32900 (ORNL/CSD/TM—146)
Lee, D.M., *See* Phillips, J.R., 7:31820
Lee, E.S., Invariant imbedding, method of characteristics, and parameter estimation, 7:32932 (USC—113P-66)
Lee, G.S., Fabrication of PWR fuel assembly and CANDU fuel bundle, 7:31926 (KAERI/RR—243/80)
Lee, H.Y., *See* Ha, C.W., 7:32415
Lee, I.W., *See* Suh, D.W., 7:31786
Lee, J.B., Core management and performance analysis for PWR, 7:31924 (KAERI/RR—225/80)
Lee, J.T., *See* Kim, J.D., 7:31974
Lee, K.A., *See* Kang, Y.H., 7:31939
Lee, K.C., *See* Ha, C.W., 7:32415
Lee, K.W., *See* Chung, M.K., 7:31925
Lee, K.Y., *See* Yang, K.R., 7:32199
Lee, S.H., *See* Lee, Y.W., 7:32032
Lee, S.K., *See* Lee, C.K., 7:31923
See Lee, J.B., 7:31924
Lee, S.Y., *See* Koh, B.J., 7:31997
Lee, W.W., Nitroimidazoles of low toxicity and high activity as radiosensitizers of hypoxic tumor cells, 7:32584
Lee, Y.K., *See* Lee, B.K., 7:31995
Lee, Y.P., Development of nondestructive testing technique. Ultrasonic testing and radiographic testing, 7:32453 (KAERI/RR—262/80)
Lee, Y.W., Experimental study of safety injection and reflooding, 7:32032 (KAERI/RR—231/80)
Lee-Franzini, J., Upsilon physics with CUSB, 7:32422 (SLAC—245, pp 381-401)
Lehmann, D., *See* Muller, G., 7:32705
Leigh, R., *See* Bright, R., 7:31834
See Fthenakis, V., 7:31866
Leire, R., Straw as energy source, 7:32307 (NP—2900612)
Lejkin, Yu.A., *See* Dedov, V.B., 7:32191
Lemmertz, P., *See* Dersch, G., 7:32349
Lempicki, A., Development of materials for a luminescent solar collector. Annual progress report, Septemer 1, 1979-December 31, 1980, 7:31877 (DOE/ER/04996—2)
Leonchuk, N.P., Numerical technique for calculating coolant velocity and temperature fields in a nuclear reactor, 7:31980 (FEI—1100)
Lepage, G.P., QCD and heavy quark atoms, 7:32748 (SLAC—245, pp 459-476)
See Brodsky, S.J., 7:32756
LePera, M.E., *See* Stavinoha, L.L., 7:31761
Lessing, P., Storage of low-level radioactive waste: a potential West Virginia alternative. Circular No. C-21, 7:31798 (NP—2902483)
Letki, F., *See* Jurgens, R.F., 7:32455
Letnitskii, Yu.A., *See* Shmelev, V.E., 7:31958
Levi, M.P., Economics and operating characteristics of various materials-handling systems and wood fuels in small- to medium-sized boilers. Final report, 7:32122 (DOE/ET/20618—T1)
Levine, A., *See* Perwin, E., 7:31873
Lewis, J.H., Safety/licensing assessment of the 1170-MW(t) HTGR process heat plant, 7:32018 (GA-A—16467)
Ley, R.D., Measurement of gap filling by bromouracil photolysis, 7:32582
Li, G., *See* Liu, Z., 7:32435
Liberman, M.S., *See* Croff, A.G., 7:31956
Liborio, G., *See* Bocchio, R., 7:32597
Lidvansky, A.S., *See* Chudakov, A.E., 7:32676
Liebing, D.F., Atmospheric Cerenkov measurements of EAS, 7:32636
See Gerhardy, P.R., 7:32664
Liebold, H.P., *See* Albrecht, R., 7:32378
Liforov, V.G., Absolute efficiency of the cylindrical neutron He^3-counter cassette, 7:32373 (FEI—1112)
Lihach, N., New connections for new technologies, 7:32085
Likhachev, Yu.I., Evaluation of the axial elongation of a can of a fuel rod in the RBMK-type reactor under the conditions of cyclic power variation, 7:31936 (FEI—1089)
Lima, F.W. de, *See* Vasconcellos, M.B.A., 7:32193
Linsley, J., *See* Benson, R., 7:32610
Lipsky, S., Contribution of electronically excited states to the radiation chemistry of organic systems. Progress report, September 1, 1980-November 30, 1981, 7:32221 (DOE/ER/00913—2)
Littmann, E.S., Microbiological contamination of fuels during storage, 7:31763
Liu, J., *See* Liu, Z., 7:32435
Liu, Z., Experiment project of $\mu\nu$ detection in shallow underwater, 7:32435
Llaurado, J.G., Differences between ^{201}TI and ^{43}K tissue distribution in rested and exercised rats, 7:32575
Lloyd, W.G., Predictors of plasticity in bituminous coals. Technical progress report No. 1, 7:31726 (DOE/PC/40793—T1)
Lobanov, Yu.V., *See* Druin, V.A., 7:32793
Lobo, L.G., Coastdown in light water reactors as a fuel management strategy, 7:31920 (INIS-mf—6753)
Locke, F.E., *See* Quong, R., 7:31896
Lode, W., X-ray-measurable deformations in superficial layers and their representations, 7:32293
Loewenhaupt, M., *See* Debray, D., 7:32165
Loginov, V.D., *See* Pevtsov, V.V., 7:32417
London, J.E., *See* Thomas, R.G., 7:32573
Loos, U., Determination of endogenous labelling of thyroid hormones during a radioiodide test in euthyroid goiter

patients and hyperthyroid patients, 7:32561
Lopez, S., *See* Almanza, R., 7:31880
Losert, W., On-line phase and amplitude measurement of pulsed rf at 27 and 108 MHz, 7:32444 (GSI—81-2, pp 242)
Lotem, H., Generation of UV radiation utilizing the copper vapor laser lines, 7:32850 (IA—1364, pp 82)
Lougheed, R.W., Tests of curium metal targets for the synthesis of superheavy elements, 7:32348 (GSI—81-2, pp 187)
See David, F., 7:32243
Louis, J.F., *See* Motakef, S., 7:31905
Lowdermilk, W.H., Coatings for laser fusion, 7:32903 (UCRL—87037)
Lowe, A.T., *See* Hosford, C.D., 7:31823
Luczynski, Z., *See* Wlodek, S., 7:32223
Luft, G., Neutron probe and the detection of soil moisture, 7:32425
Lundsager, P., *See* Andersen, P.S., 7:31900
Lundy, R.T., *See* Collins, J.J., 7:32590
Lunsford, J.H., *See* Fajula, F., 7:31830
Lymar, A.G., Ion acceleration in heavy-current electron beam injected in neutral gas, 7:32353 (KFTI—80-45)
Lynch, V.E., *See* Holmes, J.A., 7:32875
Lyubtsev, R.I., *See* Abdulakhatov, M.K., 7:31787

M

Ma, H.H., *See* Chan, S.H., 7:31996
Ma, Z., Calculation of muon final probabilities after muon-induced fission in a four-state basis, 7:32802
Maaswinkel, A.G.M., Experimental investigation of linear mode conversion in laser-produced plasmas, 7:32876 (PLF—39)
Mac Gregor, M.H., Interpretation of the N(1360) Gamma < 67 resonance, 7:32737
MacGregor, R., *See* Reivich, M., 7:32540
Machavariani, S.K., *See* Danilova, T.V., 7:32657
Machida, M., *See* Matano, T., 7:32667, 7:32668, 7:32669, 7:32678
MacKeown, P.K., *See* Lai, K.F., 7:32630
Madden, J.A., *See* Llaurado, J.G., 7:32575
Madisen, D.E., *See* Guo, K.J., 7:31887
Madsen, V.A., *See* Bernstein, A.M., 7:32801
Maeda, T., *See* Asakimori, K., 7:32677
Maenner, R., *See* Walter, P. v., 7:32375
Mahlab, M.S., *See* Thurman, A.L., 7:32050
Mahlum, D.D., *See* Felix, W.D., 7:31747
See Mercer, B.W., 7:31730
Mai, L.P., Engineering design of a toroidal divertor for the EBT-S fusion device. Final report, Phase II. EBT-S divertor project, 7:32901 (ORNL/Sub—81/21086/2)
Maia, C.R.M., One-group transport theory calculation for three slabs cells, 7:31993 (IEA-DT—148)
Maier, M., *See* Baden, A., 7:32383
Maier, M.R., Simplified constant fraction discriminator circuit for application in multichannel discriminators, 7:32376 (GSI—81-2, pp 213)
Maiorella, B., *See* Wilke, C.R., 7:31829
Maisheev, V.A., Effect of electron beam parameters on the coherent bremsstrahlung in monocrystals, 7:32810 (IFVE-OP—81-17)
Makarov, V.V., *See* Galkin, V.I., 7:32652
Makhmudov, B.M., *See* Khristiansen, G.B., 7:32637, 7:32638
Maki, K., *See* Tone, T., 7:32872
Makino, M., Two dimensional behavior of solitons in a low-β plasma with convective motion, 7:32863 (IPPJ—480)
Mal'gin, A.S., *See* Dadykin, V.L., 7:32439
Malick, F.S., *See* Mai, L.P., 7:32901
Mallett, R.H., *See* Schott, G.A., 7:31953
Malwitz, E., Engineering and technology, 7:32335 (GSI—81-2, pp 229-232)
Manahan, M.P., Development of a miniaturized disk-bend test for the determination of postirradiation mechanical properties, 7:32885 (DOE/ER/10107—12)
Mann, D.M., *See* Armitage, R., 7:32621
See Blake, P.R., 7:32618
Mann, R., Experimental setup for high resolution Auger electron and X-ray spectroscopy, 7:32447 (GSI—81-2, pp 197)
See Dohmann, H.D., 7:32446
Maor, I., *See* Lougheed, R.W., 7:32348
March-Leuba, J.A., CARDIOGRAMA: a stochastic, semi-empirical methodology for power-reactor surveillance and diagnostics, 7:31959 (CONF-811103—68)
Marchi, E., Games of protocol, 7:32931 (USC—113P19-78)
Maree, M., *See* Dormehl, I.C., 7:32563
Margaryan, A.T., Multiple scattering in thin layers of substance, 7:32806 (EFI—431(38)-80)
See Bayatyan, G.L., 7:32805
Maritz, F.I., *See* Grant, M.A., 7:31785
Mariz, A.M., Transfer matrix treatment of atomic chemisorption on transition metal surface, 7:32159 (PUC-tn—07/80)
Marnell, P., *See* Krishna, C.R., 7:31739
Martin, W., *See* Eichler, H.J., 7:32269
Martynenko, Yu.V., Defect formation in semiconductors under ion bombardment, 7:32809 (IAE—3261/11)
Marx, D., *See* Huber, G., 7:32385
Mashnik, S.G., *See* Gudima, K.K., 7:32800
Maskarinec, M.P., *See* Caton, J.E., 7:32530
Maslennikova, N.U., Bimodality of angular distribution in hadron-nucleon interactions at 200 to 400 GeV, 7:32735
Maslov, O.D., *See* Chosnovska, V., 7:32195
Mason, D.M., Conversion of kerogen of Eastern US oil shale by tetralin and hydrogen, 7:31773 (CONF-820217—5)
Mason, M.J., *See* Mercer, B.W., 7:31776
Massini, G., NENEG: programma per la generazione automatica di reticoli per codici di calcolo ad elementi finiti tridimensionali, 7:32912 (CNEN-RT/ING—80-27)
Masuda, K., *See* Takita, K., 7:32717
Matano, T., Air shower cores observed with emulsion chambers combined with the air shower array at Mt. Chacaltaya, 7:32668
Core structure studied with the lattice air shower detectors at Mt. Chacaltaya, 7:32669
Energy flow of air shower cores in Akeno, 7:32678
SYS air shower experiment at Mt. Chacaltaya, 7:32667
Mathews, I., *See* Hocking, G., 7:31806
Mathieu, T.J., Service-interruption reporting, 7:32921 (PNL-SA—9984)
Matlock, D.K., *See* Olson, D.L., 7:32135
Matsuo, K., Clustering of metal atoms in organic media. 9. High-activity Ni/MgO catalysts prepared by metal vapor methods. Surface area and particle size effects, 7:32205
Matumoto, Z., *See* Ihara, H., 7:32776
See Tamura, T., 7:32763
Matushko, V.L., *See* Dedenko, L.G., 7:32750
Matyushevskii, E.A., *See* Zanevskii, Yu.V., 7:32413
Maxey, D.V., *See* Carter, J.G., 7:32423
Maya, L., Raman spectroscopy study of hydroxo and carbonato species of the uranyl (VI) ion, 7:32238
Mayo, H.A. Jr., Powerhouse-gate: concept definition study, 7:31832 (DOE/ID/12200—T1)
Mazumdar, A.K., Status report on the HELIOS system, 7:31824 (GSI—81-2, pp 370)
McAtee, R.E., *See* Allen, C.A., 7:31891
McBrayer, J.D., Materials and interfaces for high temperature MOS and CMOS components, 7:31886 (SAND—82-0425, pp 125-136)
McCann, K.J., *See* Flannery, M.R., 7:32712
McCarthy, D.R., *See* Setlow, J.K., 7:32545
McCollum, B.C., *See* Lempicki, A., 7:31877
McComb, T.J.L., Computer simulations of atmosphere Cerenkov radiation in large cosmic ray showers, 7:32651
See Andam, A.A., 7:32628, 7:32649, 7:32650
See Chantler, M.P., 7:32648
See Gibson, A.I., 7:32617
Mccorkle, D.L., *See* Carter, J.G., 7:32423
McCue, H.K., Motion control system for the Large Optics Diamond Turning Machine (LODTM), 7:32254 (UCRL—86438)
McCusker, C.B.A., *See* Bray, A.D., 7:32615
McDonald, D.M., Frequency spectrum of radio emission from air showers, 7:32635
McDowell, W.J., *See* Kinard, W.F., 7:32218
McElroy, M., *See* Whitaker, R., 7:32311
McEntire, B.J., *See* Gordon, R.S., 7:32068, 7:32069
McGee, T., *See* Boyle, J.F., 7:31760
McGibney, D.J., Advances in detectors for Dumand arrays, 7:32427
McHugh, S.L., Fracture of Devonian shale by tailored pulse-loading. Final report, August 15, 1977-August 15, 1978, 7:31769 (DOE/ET/12074—T1)
Fracture of Devonian shale by tailored pulse-loading. Quarterly progress report 2, January 1-March 31, 1978, 7:31770 (DOE/ET/12074—T3)

McInroy, J.F., Deposition and retention of plutonium in the United States general population, 7:32577
See Boyd, H.A., 7:32578
McIntyre, P.M., High-energy-physics program at Texas A and M University. Annual progress report, July 15-December 1, 1981, 7:32358 (DOE/ER/40039—1)
McIntyre, T.R., Mark III Confirmation Test Program, 7:32021 (GKSS—81/E/27, pp I 43-79)
McLaren, R.J., *See* Duvel, W.A. Jr., 7:31727
McMaster, K.M., *See* Chamberlain, R.G., 7:31856
McShane, M.C., *See* Skalski, J.R., 7:32498
Megusar, J., Microstructure of rapidly solidified Al_2O_3-dispersion-strengthened Type 316 stainless steel, 7:32137 (DOE/ER/10107—3)
Microstructure of rapidly solidified Path A Prime-Candidate Alloys, 7:32882 (DOE/ER/10107—8)
See Arnberg, L., 7:32881
See Testart, E., 7:32139
Mehnert, R., *See* Brede, O., 7:32224
See Naumann, W., 7:32225
Meinert, J.C., *See* Ehret, C.F., 7:32568
Melamud, M., *See* Gurewitz, E., 7:32207, 7:32208
Melo, C., Influence of buildings geometrical and physical parameters on thermal cooling load, 7:32111 (INIS-mf—6766)
Menlove, H.O., *See* Phillips, J.R., 7:31820
Mercer, B.W., Assessment of synfuel spill cleanup options, 7:31730 (PNL-SA—9806)
Evaporation of in-situ oil-shale-retort water, 7:31776 (PNL-SA—9805)
Meridith, W.R., *See* Richter, S.W., 7:31930
Merten, R., *See* Arlt, U., 7:32388
Meshcheryakov, M.G., *See* Abdurakhimov, A.U., 7:32402
Metag, V., *See* Graef, H., 7:32382
Meunier, R., Production of thin targets of high isotopic enrichment with an electromagnetic separator, 7:32346 (GSI—81-2, pp 184)
Meyer, C., *See* Rojey, A., 7:32118
Meyer, E.J., User's manual for the AMEER flight path-trajectory simulation code, 7:32922 (SAND—80-2056)
Meyer, J.E., *See* Adegbulugbe, A.O., 7:32883
See Harling, O.K., 7:32141
Meyer, K.R., *See* Witschi, H., 7:32585
Meyer, L., Heat transfer and pressure drop at single rods with three-dimensional roughnesses. Large scale tests, 7:32274 (KFK—3164)
Heat transfer and pressure drop at single pins with three-dimensional roughnesses, 7:32275 (KFK—3165)
Velocity and temperature profiles in rough annuli, 7:32273 (KFK—3163)
Meyer, R.E., *See* Palmer, D.A., 7:32244
Meyer, S.F., *See* Hsieh, E.J., 7:31822
Michaelis, H., Discussion on the hard or soft way in future energy supply, 7:32075 (NP—2901424)
Michener, J.R., *See* Burns, S.J., 7:32170
Mikasa, G., *See* Perwin, E., 7:31873
Mikhajlov, L.V., *See* Gangrskii, Yu.P., 7:32786
Mikhalake, D., *See* Gavrilenko, G.M., 7:32707
Miles, C.R., *See* Wray, W.O., 7:31869
Millemann, R.E., *See* Giddings, J.M., 7:32593
Miller, A., Investigation of the radiochromic dye film dosimeter under process conditions, including stability, precision, accuracy, the influence of dose rate, and the influence of the environment. Part of a coordinated programme on high-dose standardization and intercomparison for industrial radiation processing. Final report for the period 1 August 1977 - 31 July 1981, 7:32390 (IAEA-R—2051-F)
Miller, D.W., *See* Hajek, B.K., 7:31998
Miller, G.N., *See* Hardy, J.E., 7:31929
Miller, G.R., *See* Gordon, R.S., 7:32068, 7:32069
Miller, J.R., Rates, distances, and energy control of electron tunneling reactions in rigid media, 7:32227
Miller, M., *See* Whitaker, R., 7:32311
Miller, M.B., *See* Gangrskii, Yu.P., 7:32786
Mills, J.C., *See* Brunings, J.E., 7:32037
Milovanov, Yu.L., *See* Bakov, A.T., 7:31999
Min, D.K., *See* Lee, B.K., 7:31995
Minami, M., *See* Takatsu, H., 7:32896
Minashin, M.E., *See* Lantsov, M.N., 7:32000
Mingay, D.W., Effect of elastically scattered protons on the energy resolution of x-ray detectors in PIXE measurements, 7:32420 (PEL—277)
Mintz, M.H., Moessbauer effect studies of Npsub(x)Pusub(1-x) (0.15<=x<=1) dihydrides, 7:32700 (IA—1364, pp 90)
Mircheva, D., *See* Buttseva, G.L., 7:32408
Miron, E., *See* Lavi, S., 7:32851
Mironova, T.M., *See* Liforov, V.G., 7:32373
Misaki, A., *See* Jogo, N., 7:32654
Mishin, V.Ya., *See* Abdulakhatov, M.K., 7:31787
Mitsui, K., *See* Kitamura, T., 7:32428
Mittas, M., *See* Kutzner, J., 7:32564
Miyake, S., Observation of hadronic components and muons in EAS at mountain altitude, 7:32663
Study of EAS development, 7:32658
Mizushima, K., *See* Asakimori, K., 7:32677
Mizutani, Y., *See* Shibata, T., 7:32895
Moeller, R., Steady-state, local temperature fields with turbulent sodium flow in nominal and disturbed bundle geometries with spacer grids, 7:31947 (KFK—2856)
Moemerzheim, K., *See* Albrecht, R., 7:32378
Mogul, J., Corrosion-erosion test rig for high temperature turbine materials evaluation, 7:31907
Mohr, C.L., *See* Hann, C.R., 7:32017
Mohr, D., *See* Lambert, J.D.B., 7:32041
Mohri, A., Spinning plasma ring stable to tilting mode, 7:32862 (IPPJ—478)
Mokashi, A.R., Sensitivity analysis of the add-on price estimate for the silicon web growth process, 7:31838 (DOE/JPL—1012-61)
Mokler, P.H., *See* Schartner, K.H., 7:32380
Molt, R., *See* Eichler, H.J., 7:32269
Molton, P.M., Literature survey of intermediate products formed during the thermal aqueous degradation of cellulose, 7:31854
Monk, P., *See* Dyer, P.E., 7:32266
Montenegro, E.C., Correction factor for hair analysis by PIXE, 7:32201 (PUC-tn—14/79)
See Baptista, G.B., 7:32202, 7:32203
Montoya, A.P., Resistance after firing protected electric match, 7:32072
Moody, E., *See* Brunings, J.E., 7:32037
Moody, F.J., *See* Au-Yang, M.K., 7:32052
Moon, K.S., *See* Lee, C.K., 7:31923
See Lee, J.B., 7:31924
Moore, S.W., Solar-absorber-selective paint research, 7:31879 (LA-UR—81-3610)
Morello, C., *See* Castagnoli, C., 7:32643
Moreno Gonzalez, A., Version E2 from Dimco-System for the statistical calculation of components, 7:31984 (JEN—500)
Morgan, T.O., *See* Sasscer, D.S., 7:31864
Morgenschweis, G., *See* Luft, G., 7:32425
Moriarty, K.J.M., *See* Drouffe, J.M., 7:32760
Moritz, G., *See* Breitenberger, G., 7:32341
See Langenbeck, B., 7:32350
Morozov, S.I., Study on inelastic scattering spectra of slow neutrons in yttrium-aluminium garnet crystals with rare earth additions, 7:32807 (FEI—1130)
See Danilkin, S.A., 7:32171
Morrison, G.W., *See* Croff, A.G., 7:31956
Morrison, I., *See* Wiemers, M., 7:32334
Morrison, L.S., Comparison of heat pump water heaters and solar domestic water heaters, 7:32116 (SERI/TP—254-1482)
Mosle, H.G., Sound emission analyses used for material tests, 7:32294
Motakef, S., Critical heat flux in the channels of a closed-loop water-cooled turbine, 7:31905
Mottana, A., *See* Bocchio, R., 7:32597
Movchan, S.A., *See* Zanevskii, Yu.V., 7:32413
Moyer, R.O. Jr., *See* Zhuang, J., 7:32176
Mueller, G., Sediments as criteria for water quality, 7:32529
Mueller, J., *See* Deitinghoff, H., 7:32320
Mueller, M., Plasma oscillations induced intensity modulations of the Unilac ion beam, 7:32322 (GSI—81-2, pp 248)
See Angert, N., 7:32315
Mueller, R.W., Accelerator studies for heavy-ion fusion, 7:32359 (GSI—81-2, pp 262)
Wrapping screw: An alternative to synchrotron type storage rings for HIF, 7:32351 (GSI—81-2, pp 270)
See Beckert, K., 7:32361
See Deitinghoff, H., 7:32320
Mueller, W., *See* Arlt, U., 7:32388
Mulcahy, T.M., Flow-induced vibration testing scale modeling relations, 7:31989
Muller, G., Statistical limits for the unfolding of closely overlapping peaks in the X-ray spectrum analysis, 7:32705 (JINR—E-7-12219)
Mundry, E., *See* Hecht, A., 7:32290
Muranov, Yu.V., *See* Kashcheev, V.M., 7:31982

Murin, J.M., *See* Anson, D., 7:31743
Murray, A.F., *See* Buyers, W.J.L., 7:32819
Murri, W.J., *See* McHugh, S.L., 7:31769, 7:31770
Musikas, C., Electrochemical studies of trivalent californium and selected trivalent lanthanides in aqueous solutions, 7:32242
Musiol, G., *See* Muller, G., 7:32705
Mustoe, G., *See* Hocking, G., 7:31806
Muzychka, Yu.A., *See* Orlova, O.A., 7:32790
Myser, R.D., *See* Hajek, B.K., 7:31998

N

Nadeau, L.J., Monitoring of nuclear power plant reactor vessel thermal transients and fatigue usage factors, 7:32046
Naeslund, L., *See* Zipfel, P.F., 7:32546
Naftulin, S.M., *See* Gerasimov, S.N., 7:32852
Nagano, K., *See* Kunori, S., 7:32782
See Toba, Y., 7:32791
Nagasawa, T., *See* Nishida, Y., 7:32859
Nagel, K., Importance parameters for reliability analyses of systems, 7:32066
Nagy, J., *See* Denes, E., 7:32406
Nahm, K.J., Manufacturing of laboratory equipments, 7:31940 (KAERI/RR—238/80)
Nair, R.P.K., *See* de Moura Neto, C., 7:31962
Nakagawa, T., *See* Oka, Y., 7:32770
Nakai, Y., *See* Sataka, M., 7:32704
Nakamura, I., *See* Aoki, T., 7:32429
Nakamura, K., Measurement of total cross-section of antiproton-proton reaction in the momentum range between 400 and 700 MeV/c, 7:32727 (KEK—79-33, pp 242-285)
Nakashita, M., *See* Higaski, S., 7:32685
Nakasima, R., *See* Ihara, H., 7:32776
Nakayama, K., Modified version of the Monte Carlo computer code for calculating neutron detection efficiencies, 7:32391 (IFUSP-P—250)
Namatame, K., *See* Kukita, Y., 7:32020, 7:32030, 7:32031
Namsraj, Yu., *See* Vagov, V.A., 7:32001
Narodetsky, I.M., Scattering integral equations and four-nucleon problem. Integral equations for Weinberg quasiparticles, 7:32799 (ITEP—13(1981))
Nash, W.F., *See* Armitage, R., 7:32616, 7:32621
See Blake, P.R., 7:32618
Naumann, W., Reaction kinetics of cationic primary products in nonpolar solutions, 7:32225 (Zfl-Mitt—35, pp 61-71)
Naumov, B.P., *See* Baranchuk, M.K., 7:32452
Naumov, Yu.V., *See* Bykov, A.A., 7:32771
Navarra, G., *See* Castagnoli, C., 7:32643
See Chudakov, A.E., 7:32676
Navvab, M., Development and use of a hemispherical sky simulator, 7:32112 (LBL—13400)
Nazarov, V.I., *See* Khristiansen, G.B., 7:32656
Nechin, Yu.A., *See* Kalmykov, N.N., 7:32646
Neely, H.H., Sodium-water reaction testing in support of LMFBR steam generator development, 7:32034
Nefed'eva, L.S., Directives of the SPS spectrum processing system, 7:31973 (JINR-R—10-80-861)
See Buttseva, G.L., 7:32408
Nehrguj, B., *See* Abdurakhimov, A.U., 7:32402
Neihof, R.A., Microbial contamination of ship fuels, 7:31762
Neilson, A.J., Dynamic crushing loads of thin-walled steel tubes, 7:31976 (AEEW-M—1830)
Nejabat, H., *See* Ashton, F., 7:32671
Nelson, G.C., Surface composition and erosion yields for CVD TiB_2 films subjected to low energy deuterium ion bombardment, 7:32715
Nemets, O.F., *See* Grantsev, V.I., 7:32416
Netusilova, Z., *See* Zanevskii, Yu.V., 7:32413
Neu, W., *See* Meyer, L., 7:32275
Neumann, E., *See* Hecht, A., 7:32290
Neumann, H., Nondestructive testing of steel lifting bands of the refueling machine of the nuclear ship OTTO HAHN using a special ultrasonic method, 7:32013
Neumann, W., *See* Deitinghoff, H., 7:32320
Newman, D.F., Assessment of nonbackfittable concepts for improving uranium utilization in LWRs, 7:31918 (PNL-SA—9100)
Newman, L., Environmental Chemistry Division annual report, 7:32479 (BNL—27818)
Newton, D., *See* Campbell, G.W., 7:32823
Nguen Khak Tkhi, *See* Fefilov, B.V., 7:32451
Nickel, F., *See* Meunier, R., 7:32346
Nicolet, M.A., *See* Grimaldi, M.G., 7:32426
Nicoletti, M., *See* Bocchio, R., 7:32597
Nikitenko, Yu.V., Magnetic field stabilization within the 1-10 mkT range by means of cesium quantum magnetometer, 7:32002 (JINR-R—13-12037)
Nikitin, V.A., *See* Deenski, P.A., 7:32725
Nikolaev, V.A., *See* Likhachev, Yu.I., 7:31936
Nikolaeva, S.A., *See* Shmelev, V.E., 7:31958
Nilsson, L., *See* Drake, D.M., 7:32795
Nishi, K., *See* Inoue, N., 7:32640
Nishida, H., *See* Tone, T., 7:32872
Nishida, Y., Oblique collision of plane ion-acoustic solitons, 7:32859 (IPPJ—475)
Nishikawa, K., Tearing modes in a current sheet with weak normal magnetic field, 7:32858 (IPPJ—474)
Nitsche, A., Cost comparison of several heating systems, 7:32117
Nitschke, J.M., *See* Lougheed, R.W., 7:32348
Niu, K., *See* Abe, T., 7:32892
Noll, H., *See* Arlt, U., 7:32387
Nordman, J.E., *See* Guo, K.J., 7:31887
Noronha, O.P.D., Nature of technetium compounds. Pt. 1, 7:32558
Norris, E., *See* Ogard, A., 7:32535
North, B.E., *See* Schoenborn, B.P., 7:32567
Norton, E., *See* Douglas, J., 7:32086
Norton, P.R., *See* Buyers, W.J.L., 7:32819
Norwood, F.R., Axisymmetric solutions in elastostatics and elastic wave propagation by ascent methods, 7:32847 (SAND—81-1729C)
Noufi, R., Enhanced stability of photoelectrodes with electrogenerated polyaniline films, 7:31853 (SERI/TP—211-1494)
Noun, R., *See* Perwin, E., 7:31873
Novikov, A.G., *See* Liforov, V.G., 7:32373
Nozik, A.J., *See* Noufi, R., 7:31853
Nyitray, A.M., *See* Heaton, R.C., 7:31728

O

O'Connell, B., *See* Armitage, R., 7:32616, 7:32621
See Blake, P.R., 7:32618
O'Gallagher, J., *See* Winston, R., 7:31878
O'Grady, M.J., *See* Levi, M.P., 7:32122
O'Kelley, G.D., *See* David, F., 7:32243
Obnorskii, V.V., *See* Baranov, I.A., 7:32711
Odenweller, T., *See* Arlt, U., 7:32387
Oestreich, V., *See* Jung, V., 7:32764
Oganesyan, Yu.Ts., Experiments on the fusion of element 108 in the $^{226}Ra+^{48}Ca$ reaction, 7:32792 (JINR-R—7-12054)
See Orlova, O.A., 7:32790
Ogard, A., Solubility limits of importance to leaching, 7:32535
Ogasawara, M., Relation between Weibel instability and magnetic field generating thermal instability, 7:32867 (IPPJ—485)
See Hatayama, A., 7:32864
Oh, H.K., *See* Nahm, K.J., 7:31940
Oh, J.H., *See* Song, D.H., 7:31922
Oh, Y.K., *See* Suh, D.W., 7:31786
Ohashi, Y., *See* Aoki, T., 7:32429
Ohira, F., Characterization of ion beam processed Si surface layer, 7:32718
Ohsawa, Y., Simulation of plasma confinement in RF plugged cusp field, 7:32861 (IPPJ—477)
Ohshima, M., *See* Tamura, T., 7:32763
Ohta, I., *See* Fumuro, F., 7:32686
Ohta, K., *See* Matano, T., 7:32667, 7:32668, 7:32669
Ohta, M., *See* Takatsu, H., 7:32896
Oka, Y., Evaluation of neutron nuclear data for ^{45}Sc, 7:32770 (NEANDC(J)—80/U)
Okamoto, M., *See* Shimizu, K., 7:32865
Okamoto, Y., *See* Kitamura, T., 7:32428
Okinaka, R.T., *See* Strniste, G.F., 7:32587
Okumura, Y., *See* Shibata, T., 7:32895
Oliva, G., Neutronic transmutation of transuranium isotopes in a fast neutron power reactor, 7:31944 (EUR—7008)
Olsen, C.R., Reactor-released radionuclides in Susquehanna River sediments, 7:32522
Olson, D.L., Ferrous alloy metallurgy - liquid-lithium corrosion and welding. Progress report, January 1, 1981-December 31, 1981, 7:32135 (DOE/ER/02313—11)
Olson, N.J., *See* Hann, C.R., 7:32017
Olson, R.E., Collisional processes of interest in MFE plasma research. Annual report, October 1, 1980-

September 30, 1981, 7:32696 (DOE/ET/53025—T10)
Oltman, B.G., *See* Schlenker, R.A., 7:32581
Onischak, M., *See* Babu, S.P., 7:31835
Onken, U., *See* Weiland, P., 7:32464
Ono, S., *See* Takatsu, H., 7:32896
Oosterhuis, J.W., *See* Hoving, J., 7:32559
Orekhov, V.I., *See* Lantsov, M.N., 7:32000
Orford, K.J., Separation of the charged particle and Cerenkov light components of large cosmic ray showers, 7:32647
See Andam, A.A., 7:32628, 7:32649, 7:32650
See Chantler, M.P., 7:32648
Orlov, A.M., *See* Maslennikova, N.U., 7:32735
Orlov, V.I., *See* Abdulakhatov, M.K., 7:31787
Orlova, G.I., *See* Maslennikova, N.U., 7:32735
Orlova, O.A., Study on the ^{48}Ca ion fusion with sup(203,205)Tl, sup(208)Pb and sup(209)Bi nuclei, 7:32790 (JINR-R—7-12061)
Orth, C., *See* Ogard, A., 7:32535
Osborne, M.M., *See* Toth, L.M., 7:32241
Oskomov, V.V., *See* Friedman, S.D., 7:32440
Ososkov, G.A., *See* Abdurakhimov, A.U., 7:32402
Ostanevich, Yu.M., *See* Vagov, V.A., 7:32001
Osterby, O., *See* Gear, C.W., 7:32930
Ostreikovskii, A.A., Determination of quantity performances of the parametric reliability for unique objects, 7:31914 (FEI—1126)
Ostrovnoj, A.I., Method of parallel processing in SANPO real time system, 7:32916 (JINR-R—10-81-342)
Otawa, T., Development of slide program describing site-selection process for Small Wind Energy Conversion Systems (SWECS), 7:31899 (DOE/R5/10301—1)
Otsuki, H.H., *See* Quong, R., 7:31896
Overbury, S.H., Energy and angular distribution of low energy H^+ and D^+ backscattered from polycrystalline carbon, 7:32714
Ozaki, S., Detection of the nucleon decays by the calorimeter composed of the neon flash chambers, 7:32438
Experimental meson spectroscopy, 7:32741 (KEK—79-33, pp 1-41)
See Higaski, S., 7:32685

P

Pabst, M., *See* Crandall, K.R., 7:32326
Pachala, S., *See* Dzikowski, T., 7:32660
Paffenhoefer, G.A., Biological processes in the water column of the South Atlantic Bight. Progress report, 7:32603 (DOE/EV/00936—T3)
Paffrath, L., FASTBUS demonstration systems, 7:32926 (SLAC-PUB—2835)
Pagni, P.J., *See* Beier, R.A., 7:31766
Pahnke, V.A., *See* Kirchner, F.R., 7:32591
Paidoussis, M.P., Fluidelastic vibration of cylinder arrays in axial and cross flow--state of the art, 7:31988
Palermo, L., Induced magnetism via conduction electron exchange; application to $PrAl_3$, 7:32134 (CBPF-A—0021/80)
Magnetic behavior of Van Vleck ions and an electron gas interacting by exchange, 7:32692 (CBPF-A—0007/80)
Palmer, D.A., Adsorption of technetium on selected inorganic ion-exchange materials and on a range of naturally occurring minerals under oxic conditions, 7:32244
Pan, Y.S., Final test report on the combustion of solvent-refined coal in a 100 hp firetube boiler, 7:31742 (DOE/PETC/TR—82/5)
Papirov, I.I., *See* Karpov, E.S., 7:32155
Parafilo, L.M., *See* Shcherbakov, S.I., 7:31979
Parak, F., *See* Rochev, V.Ya., 7:32842
Parfenov, V.A., *See* Liforov, V.G., 7:32373
Park, D.K., *See* Kang, Y.H., 7:31939
Park, D.S., *See* Song, D.H., 7:31922
Park, H.G., *See* Suh, K.S., 7:31994
Park, M.H., *See* Chang, I.S., 7:32236
Park, T.G., *See* Suh, K.S., 7:31994
Parkhurst, B.R., *See* Giddings, J.M., 7:32593
Paschall, R.K., *See* Tupper, R.B., 7:32038
Paschoa, A.S., *See* Baptista, G.B., 7:32202, 7:32203
See Cullen, T.L., 7:32521
See Montenegro, E.C., 7:32201
Pathak, K.M., Simplified method of calculation of Cerenkov pulse height distribution from EAS, 7:32653
Patouillet, C.E., *See* Neihof, R.A., 7:31762
Patterson, D.O., Characteristics of three voltage regulators at high temperatures, 7:32457 (SAND—82-0425, pp 101-106)
Patterson, J.R., *See* Gerhardy, P.R., 7:32664
See Liebing, D.F., 7:32636
Patterson, R.B. III, *See* Beasom, J.D., 7:32468
Patti, F.J., Heat exchanger applications during TMI-2 post accident cooldown, 7:32039
Patton, B.D., Design of fluidized-bed, biological denitrification systems, 7:32527 (ORNL/TM—7628)
Pavlenko, V.I., Foundation of the technique for assessment of radiation consequences of nuclear power plant accidents, 7:32537 (IAE—3144)
Pavlinov, L.V., Impurities diffusion in binary titanium-zirconium and titanium-aluminium alloys in a bcc solid-solution range, 7:32146 (FEI—1145)
Investigation into carbon diffusion in multicomponent iron alloys with chromium, nickel, molybdenum and niobium in the range of γ-solid solutions, 7:32145 (FEI—1113)
Paxson, D., *See* Sitzer, S., 7:32077
Peak, L.S., *See* Bray, A.D., 7:32615
Pearce, D., *See* Coy, R.N., 7:32623
Pearce, J.B., Effects of pollution and the need for long-term monitoring, 7:32531
Peiter, A., *See* Lode, W., 7:32293
Pelroy, R.A., *See* Felix, W.D., 7:31747
Pendergast, M.M., Effect of spatial variability of meteorological data on annual average air concentrations predicted by a wind-rose model, 7:32476
Penev, V.N., *See* Abdurakhimov, A.U., 7:32402
Penko, P.F., *See* Staiger, P.J., 7:32109
Penner, J.E., Air-quality-model update, 7:32481 (UCID—19300)
Penney, W.H., *See* Buschman, H.W., 7:31951
Peppas, N.A., Macromolecular structural changes in bituminous coals during extraction and solubilization. Quarterly technical progress report, 1 September 1981-1 December 1981, 7:31724 (DOE/PC/30222—T2)
Peprah, I., *See* Gillis, M., 7:31745
Pepy, G., Structure and dynamics of d-PAA neutron scattering, 7:32841
Peregudov, V.N., Interference effects in Moessbauer spectra of M1-transitions, 7:32772 (IAE—3313/1)
Pereira, D., *See* Acquadro, J.C., 7:32769
Perepezko, J.H., *See* Guo, K.J., 7:31887
Perez, R.B., *See* March-Leuba, J.A., 7:31959
Persson, S.P.E., Agricultural anaerobic digesters: design and operation, 7:31844 (NP—2901472)
Perwin, E., Decision criteria of potential solar IPH adopters, 7:31873 (SERI/TR—663-1032)
Peshekhonov, V.D., *See* Zanevskii, Yu.V., 7:32413
Pessoa, E.F., *See* Nakayama, K., 7:32391
Pestanas, V.V., *See* Hughes, N.R., 7:32047
Peter, J., *See* Baden, A., 7:32383
Peters, H., Role of the density function of outage energy in the reliability analysis of electric power supply grids, 7:31913
Peters, T.E., New findings gained in blind shaft boring at the Zollverein mine, 7:31738 (DOE-tr—248)
Petersen, H., *See* Andersen, P.S., 7:31900
Peterson, J.R., Physical-chemical studies of transuranium elements. Progress report, April 1, 1981-March 31, 1982, 7:32230 (DOE/ER/04447—137)
See Musikas, C., 7:32242
Petrenko, A.A., *See* Ostreikovskii, A.A., 7:31914
Petrov, B.F., *See* Bykov, A.A., 7:32771
Petrucciani, C., *See* Bocchio, R., 7:32597
Petty, S.E., Treatment of biomass gasification wastewaters using wet air oxidation, solvent extraction, and reverse osmosis, 7:31849 (PNL-SA—9975)
See Mercer, B.W., 7:31730
Pevtsov, V.V., Programmable α-spectrometer for radiochemical studies, 7:32417 (NIIAR—41(449))
Pfeffer, P.G.E., *See* Friedman, S.D., 7:32440
Pfeiffer, A., Prospects of energy policy from the view of the Deutscher Gewerkschaftsbund, 7:32078
Pfeiffer, E.F., *See* Loos, U., 7:32561
Pfeiffer, I., *See* Best, K.J., 7:32844
Pfeng, E., *See* Dohmann, H.D., 7:32446
Phillips, J.R., Neutron measurement techniques for the nondestructive analysis of irradiated fuel assemblies, 7:31820 (LA—9002-MS)
See Rinard, P.M., 7:31928
Pichlmayr, R., *See* Creutzig, H., 7:32562

Picraux, S.T., Release of H and He from TiC, stainless steel, and graphite by pulsed electron and furnace heating, 7:32906
See Roth, J., 7:32908
Piers, D.A., *See* Hoving, J., 7:32559
Pimpl, M., Transfer of plutonium, americium, and curium from ground to vegetation through plant roots, 7:32512 (INIS-mf—6902, pp v)
Pinto, H., *See* Gurewitz, E., 7:32209, 7:32210
Piroth, J., *See* Arlt, U., 7:32388
Pitman, J.K., Oil-shale Fischer assay analysis from selected coreholes in the Piceance Creek Basin, Colorado. Data file, 7:31774 (PB—82-134875)
Oil-yield resources for oil-shale sequences in core from the Piceance Creek Basin, Colorado, that average 10, 15, 20, 25, 30, 35, and 40 gallons per ton. Data file, 7:31772 (PB—82-134883)
Pitt, W.W., *See* Patton, B.D., 7:32527
Pleshivtsev, N.V., Physical problems of cathode sputtering. Reviews, 7:32890 (INIS-SU—33)
Pleve, A.A., *See* Oganesyan, Yu.Ts., 7:32792
Pogutse, O.P., *See* Vikhrev, V.V., 7:32854
Pojer, P.M., *See* Baldas, J., 7:32229
Polikarpova, A.P., *See* Dedov, V.B., 7:32191
Polivanskii, V.P., To calculating plane cells by means of the $2P_0$-approximation, 7:31966 (FEI—1138)
Pompa, M.F., *See* Price, T.W., 7:32129
Pontau, A.E., *See* Bohdansky, J., 7:32167
Poon, P.T.Y., Transport processes in slabs bounded by reflectors, 7:32816 (USC—113P19-77)
Popeko, A.G., *See* Ter-Akop'yan, G.M., 7:32411
Popov, A.B., Parameters of osmium neutron resonances in 6 - 60 eV range, 7:32783 (JINR-R—3-81-19)
Popov, V.V., *See* Likhachev, Yu.I., 7:31936
Popov, Yu.p., *See* Andrzejewski, J., 7:32779
Poppensieker, K., *See* Albrecht, R., 7:32378
Portella, P.D., Study of the maguemite-hematite transformation by magnetic resonance, 7:32183 (INIS-mf—6726)
Porter, F.C., Recent results from the crystal ball, 7:32357 (SLAC—245, pp 355-380)
Porter, M.R., Study of the air-shower response of current-limited spark chambers and scintillators, 7:32673
See Hazen, W.E., 7:32672
Poteet, K.H., *See* Corbett, B.L., 7:32011, 7:32012
Potter, J.M., *See* Hansborough, L.D., 7:32325
Powell, J.W., FEDSOL: economic optimization guide for solar federal buildings projects. Model-simulation, 7:31833 (PB—82-135260)
Powell, R.G., *See* Wells, F.H., 7:32367
Powers, E.J., Stabilization of No. 2 fuel oils with caustic treating and additives, 7:31764
Pozharskii, A.V., Expansion device for a track-sensitive deuterium target, 7:32405 (JINR—13-80-808)
Poznyak, V.I., Efficiency of plasma electron cyclotron-resonance heating in the TM-3 tokamak, 7:32855 (IAE—3324/7)
Prather, W.A., *See* Khan, E.U., 7:31948
Pravdin, M.I., *See* Diminstein, O.S., 7:32624
Prazak, P.R., Design and application of -55°C to +200°C hybrid data converters, 7:32456 (SAND—82-0425, pp 93-100)
Prazhak, F., *See* Zuber, K., 7:32780
Prescott, J.R., *See* Gerhardy, P.R., 7:32664
See Liebing, D.F., 7:32636
See McDonald, D.M., 7:32635
Preston, R., *See* Jurgens, R.F., 7:32455
Preston-Anderson, A., *See* Clarke, M.M., 7:31788
Pretzl, K.P., Investigation of deep inelastic hadron hadron collisions using a transverse energy trigger with large acceptance, 7:32729 (SLAC—245, pp 495-512)
Price, T.W., Vehicle test report: Electric Vehicle Associates electric conversion of an AMC Pacer, 7:32129 (DOE/CS/54209—4)
Prilutski, O.F., *See* Berezinski, V.S., 7:32683
Prine, J.R., *See* Thomas, R.G., 7:32573
Prinz, W., Fault detection and potential measurements with buried pipes, 7:32259
Pristupa, V.I., *See* Lymar, A.G., 7:32353
Prosin, V.V., *See* Kalmykov, N.N., 7:32646
See Khristiansen, G.B., 7:32637
Protopopov, Kh.V., *See* Dobrynin, Yu.L., 7:32389
Pryanichnikov, V.I., *See* Arkharov, A.M., 7:32719
Pushkarskii, N.I., *See* Pevtsov, V.V., 7:32417
Pustyl'nik, B.I., *See* Orlova, O.A., 7:32790
Pykhtin, V.M., Long-term strength of Kh13M2S2 in biaxial stressed state, 7:32144 (FEI—1046)

Q

Qiu, J.L., *See* Eichler, H.J., 7:32269
Quarrie, D.R., Data acquisition tasks for TASSO. User manual, 7:32355 (RL—81-061)
Quilici, M.D., *See* Buschman, H.W., 7:31951
Quis, D., *See* Albrecht, R., 7:32378
Quong, R., Solvent extraction of methane from simulated geopressured-geothermal fluids: sub-pilot test results, 7:31896 (UCID—19291)

R

Rachkova, D.A., *See* Isakova, L.Ya., 7:31965
Racko, D., Influence of detecting unit sensitivity upon the recording of acoustic emission signals, 7:32292
Radtke, G., *See* Diel, R., 7:32097
Radtke, W.H., *See* Buschman, H.W., 7:31951
Rajewska, A., Neutron critical scattering in PAA, 7:32840
Rakobolskaya, I.V., *See* Deshurko, M.D., 7:32608
Ramavataram, S., Coupled-channels treatment of the positive-parity resonances in ^{4}He, 7:32767
Ramsden, D., *See* Campbell, G.W., 7:32823
Raphael, L.S., Lateral loadings on snubber assemblies, 7:32058
Rapidis, P.A., Recent results on total neutrino and antineutrino cross sections by the CFRR collaboration, 7:32724 (FERMILAB-Conf—81/80-Exp.)
Raring, D.L., New look at evaporative gas cooling and conditioning in the cement industry, 7:32312
Rasmussen, J., *See* Hollnagel, E., 7:31957
Rasmussen, J.O., *See* Ma, Z., 7:32802
Rasmussen, J.R., *See* Gordon, R.S., 7:32068, 7:32069
Ray, D.K., *See* Debray, D., 7:32165
Raymond, L.S., *See* Kerwin, W.J., 7:31884
Raynor, G.S., Design and preliminary results of the intermediate density precipitation chemistry experiment, 7:32482
Reasoner, J.W., *See* Lloyd, W.G., 7:31726
Rebel, H., Isotope shifts in unstable nuclei, 7:32781 (KFK—2974)
Reeh, W., *See* Baumann, H., 7:32180
Regan, J.D., *See* Setlow, R.B., 7:32583
Regan, R.W., *See* Persson, S.P.E., 7:31844
Reich, F.R., *See* Hann, C.R., 7:32017
Reid, H.C., *See* Hwang, J.Y., 7:31949
Reid, R.J.O., *See* Coy, R.N., 7:32623, 7:32625
Reilly, C.A. Jr., *See* Kirchner, F.R., 7:32591
Reilly, R.W., Cost of heat from a seasonal source, 7:32067 (PNL-SA—9891)
Reish, D.J., Benthic biological conditions of Los Angeles-Long Beach Harbors, 7:32532
Reister, D.B., Oak Ridge Industrial Model: an introduction, 7:32091 (CONF-801152—3)
Reivich, M., Assessment of regional glucose metabolism in aging brain and dementia with positron-emission tomography, 7:32540 (BNL—30551)
Remmert, H., Ecology, 7:32496
Renfordt, R., *See* Arlt, U., 7:32387
Renkey, E.J., Low level vibration effects on snubber life, 7:32009
Renz, M., Thermodynamic characteristics of the ternary substance system methanol-lithium bromidee-zinc bromide, 7:32280
Repnow, R., *See* Graef, H., 7:32382
Reyes, J.N. Jr., Radiative heat transfer to high pressure steam, 7:32044
Richardson, J.G., *See* Berglund, G.R., 7:31841
Richardson, R.L., *See* Irish, G.E., 7:31775
Richter, M., *See* Albrecht, R., 7:32378
Richter, S.W., Recent experience in inservice examinations, 7:31930
Rickard, W.H., Heat and blast effects of nuclear detonations on desert biota, 7:32470 (PNL-SA—9630)

Riedel, C., Correcting overlapping counts in dose calibrations at high event density, 7:32381 (GSI—81-2, pp 179)
See Blasche, K., 7:32317
See Franczak, B., 7:32323
Riedmueller, W., Pellet production methods for fueling fusion devices, 7:31821 (IPP—4/188)
Riego, A.R., *See* Braga, M., 7:32690
Riehl, N., Reminiscence of the beginning of the gammma-radiography, 7:32287
Riera, R., Percolation with first-and-second neighbour bonds: a renormalization-group calculation of critical exponents, 7:32837 (PUC-tn—05/80)
See Chaves, C.M.G.F., 7:32839
Riess, F., Generation and scaling behaviour of high-energy pions in relativistic heavy ion reactions, 7:32798 (INIS-mf—6798)
Riess, N., Testing of welds in hot state with a penetrant for high temperatures, 7:32289
Rinard, P.M., Calculated neutron-source spectra from selected irradiated PWR fuel assemblies, 7:31928 (LA—9125-MS)
Riquarts, H.P., Heat transfer between particles and fluid in aerated beds, 7:32282
Ritchie, R.O., Influences of gaseous environment on low-growth-rate fatigue-crack propagation in steels. Final report, 7:32142 (DOE/ER/10389—2)
Ritter, H.G., *See* Baden, A., 7:32383
Rittinghaus, D., Measurements of impedances for determinating the minimum short-circuit current in main systems 500 V of underground mining establishments, 7:32309
Rizzo, A.J., *See* Severud, L.K., 7:32010
Roberts, A., *See* McGibney, D.J., 7:32427
Robinson, L.A., Environmental chamber low temperature cutoff. Final report, 7:32248 (BDX—613-2722)
Robota, H.J., Optical absorption spectroscopy of molecules adsorbed on Ni(111) and energy transfer from the ^{3}eta π^* state of pyrazine to Ni(111) and Ag(111) surfaces, 7:32156 (LBL—13623)
Roche, R., *See* Lebey, J., 7:31977
Rochev, V.Ya., Moessbauer spectroscopy of thermotropic smectic liquid crystals: on the formation of complexes between label and liquid crystal molecules, 7:32842
Rochna, D., *See* Wiemers, M., 7:32334
Rodgers, R.C. Jr., *See* Powell, J.W., 7:31833
Roganov, A.B., *See* Nikitenko, Yu.V., 7:32002
Rogers, S.C., *See* Hardy, J.E., 7:31929
Rogov, S.P., *See* Yur'ev, Yu.S., 7:31991
Rogovaya, S.I., *See* Blokh, Ya.L., 7:32611
Rojey, A., Heat pump operating with a mixture of fluids. Final report, 7:32118 (PB—82-143611)
Ropp, R.C., *See* Weber, M.J., 7:32187
Rosek, J.A., *See* Bruckenstein, S., 7:32492
Rosenfeld, Y., Alternative derivation of the free energy in the mean-spherical approximation, 7:32831 (IA—1364, pp 6-7)
Universal strong coupling equations of state, 7:32832 (IA—1364, pp 7)
Universality of the bridge functions and a semi-empirical freezing criterion in 2 and 3 dimensions, 7:32830 (IA—1364, pp 6)
Roske, H., *See* Fengler, G., 7:31910
Ross, W.A., *See* Larson, D.E., 7:31800
Rosta, L., *See* Pepy, G., 7:32841
Roth, J., Trapping, detrapping and replacement of KeV hydrogen implanted into graphite, 7:32908
Rothe, K.E., *See* Holmes, J.A., 7:32875
Roussarie, A., Pion pair production in photon-photon collisions at spear, 7:32732
Rozhnyatovskaya, S.A., *See* Zanevskii, Yu.V., 7:32413
Rubin, N.B., *See* Arkharov, A.M., 7:32719
Rubtsov, E.M., *See* Abdulakhatov, M.K., 7:31787
Ruby, E., *See* Wever, G.H., 7:32565
Rudenko, B.A., *See* Grantsev, V.I., 7:32416
Ruderman, H., *See* Sathaye, J., 7:32082, 7:32105
Rudik, A.P., *See* Zaritskaya, T.S., 7:31921
Rudnev, I.I., Electric conductivity of titanium, zirconium, hafnium and its alloys. Communication 1, 7:32147 (FEI—1149)
Rudnicki, M.I., *See* Faeser, R.J., 7:31741
Rudolph, J., *See* Best, K.J., 7:32844
Rundo, J., Late excretion of plutonium following acquisition of known amounts, 7:32576
Radioactivity in former workers at a thorium refinery, 7:32580
Runstadler, P.W. Jr., *See* Dutta, P.K., 7:32458, 7:32459
Rusin, J.M., Review of multibarrier waste from development, 7:31803 (PNL-SA—9440)
See Larson, D.E., 7:31800
Russell, K.C., *See* Frost, H.J., 7:32884
Ryoo, K.K., *See* Lee, Y.P., 7:32453
Ryu, K.S., *See* Lee, B.K., 7:31995

S

Sackett, J.I., *See* Lambert, J.D.B., 7:32041
Sadovskii, S.A., *See* Bityukov, S.I., 7:32393
Sagane, T., *See* Shibata, T., 7:31927
Saha, P., Nonequilibrium vapor generation model for flashing flows, 7:32045
Saito, T., *See* Kitamura, T., 7:32428
Sakai, J., *See* Nishikawa, K., 7:32858
Sakkal, F., *See* Aust, E., 7:32022
Sakuraba, J., *See* Shibata, T., 7:32895
Sakuyama, H., Arrival time distribution of electron components near the air shower core at Akeno, 7:32665
Sal'nikov, N.I., *See* Ostreikovskii, A.A., 7:31914
Sala, O., *See* Acquadro, J.C., 7:32769
Salamatin, I.M., *See* Ostrovnoj, A.I., 7:32916
See Vagov, V.A., 7:32001
Salinas, S.R.A., *See* Yokoi, C.S.O., 7:32834
Salisbury, D.M., *See* Jackson, S.A., 7:32557
Salmanova, N.A., *See* Maslennikova, N.U., 7:32735
Salome, M., *See* Meunier, R., 7:32346
Saltykov, A.I., *See* Nefed'eva, L.S., 7:31973
Samhoun, K., *See* David, F., 7:32243
Samson, J.A.R., Photoionization of atoms. Final report, April 1, 1976-March 30, 1981, 7:32695 (DOE/ER/02892—30)
See Woodruff, P.R., 7:32694
Samuelson, N.H., Remote job entry (RJE) for VAX/VMS user guide, 7:32924 (SAND—81-2476)
Sanada, E.K., *See* do Nascimento, I.C., 7:32888
Sandmann, F., Steel in offshore structures, 7:31752
Santee, G.E. Jr., *See* Silling, S.A., 7:32054
Santosa, S., Corrosion of ion bombarded metals studied by neutron activation analysis, 7:32148 (GSI—81-2, pp 175)
Sanz, J.M., *See* Seah, M.P., 7:32291
Saoyan, R.A., *See* Weber, M.J., 7:32187
Sapotta, K., *See* Arlt, U., 7:32387
Sasscer, D.S., OTEC biofouling, corrosion, and materials study from a moored platform at Punta Tuna, Puerto Rico, 7:31864 (ANL/OTEC-BCM—023)
Sataka, M., Ionization cross sections for ion-atom and ion-molecule collisions, 1. Ionization cross sections for H^+, H_3^+, H_3^+, He^+ and He^{++} incident on H, H_2 and He, 7:32704 (JAERI-M—9310)
Sathaye, J., Analysis of life cycle costs of solar facilities, 7:32105 (LBL—13324, pp 1-19)
Minerals critical to the development of future energy technologies in high and low solar scenarios, 7:32082 (LBL—13324, pp 20-44)
Sato, T., *See* Makino, M., 7:32863
See Tanaka, M., 7:32869
Satpathy, S.S., Many-body effects on the x-ray spectra of metals, 7:32828 (DOE/ER/01198—1372)
Satterfield, C.N., Carbon number distribution of Fischer-Tropsch products formed on an iron catalyst in a slurry reactor, 7:31826
Savola, P.J., *See* Wei, P., 7:31917
Savvateev, A.S., *See* Vagov, V.A., 7:32001
Savvidis, E., Experimental investigation about the kinetics of sulfur trioxide-splitting, 7:32212 (Juel—1669)
Sawyer, E.C., *See* Bateman, J.E., 7:32421
Saxena, A., *See* Schoenborn, B.P., 7:32567
Schaa, V., *See* Dahl, L., 7:32339
Schadt, W., Particle detector for multi-parameter coincidence measurements in atomic physics, 7:32379 (GSI—81-2, pp 205)
Schaffner, E., *See* Wiemers, M., 7:32334
Schaller, D., *See* Perwin, E., 7:31873
Schaller, G.E., Magnetic materials and devices for high temperatures, 7:32466 (SAND—82-0425, pp 41-50)
Scharmann, A., *See* Schartner, K.H., 7:32380
Schartner, K.H., Application of a position sensitive proportional counter for an X-ray transmission spectrometer, 7:32380 (GSI—81-2, pp 206)
See Mann, R., 7:32447
Schechter, R.S., *See* Bommer, P.M., 7:31783
Schelenz, R., Transfer from vegetation to meat, 7:32519 (INIS-mf—6902, pp v)
Schempp, A., *See* Deitinghoff, H., 7:32320

See Gerhard, A., 7:32249
Schenter, R.E., *See* White, J.R., 7:31943
Scherzer, B.M.U., *See* Roth, J., 7:32908
Schlenker, R.A., Plutonium microdistribution in human bone, 7:32581
Schlesinger, S.P., Free electron laser employing an expanded hollow intense electron beam and periodic radial magnetic field, 7:32271
Schmid-Albrecht, M., Characteristics and accuracy of calculation models, 7:32520 (INIS-mf—6902, pp v)
Schmidt-Buecking, H., *See* Schadt, W., 7:32379
Schmitt, R.P., *See* Garrigan, G.A., 7:31865
Schmunk, R.E., *See* Kelsey, P.V. Jr., 7:32880
Schneider, P.J., *See* Hiskes, J.R., 7:32907
Schober, O., *See* Creutzig, H., 7:32562
Schoenborn, B.P., Weak binding gases as modulators of hemoglobin function, 7:32567
Schoeneman, D.W., *See* Kerwin, W.J., 7:31884
Schott, G.A., Experimental benchmark for piping system dynamic response analyses, 7:31953
Schrattenholzer, L., Energy-supply model MESSAGE, 7:32074
Schrock, R.R., Reduction of carbon monoxide. Past research summary, 7:32215 (DOE/ER/04949—1)
Schueller, G.I., Application of reliability theory in structural mechanics, 7:32300
Risk analysis and acceptance by the public of large power stations, 7:32539
Schuettelkopf, H., Ground/plant transfer factors of Ra-226, Po-210, and Pb-210, 7:32515 (INIS-mf—6902, pp v)
Iodine transfer from the ground into plants, 7:32509 (INIS-mf—6902, pp v)
See Pimpl, M., 7:32512
Schuler, K.W., Modeling turbine-missile impacts using the HONDO finite-element code, 7:32033 (SAND—80-2627)
Schulte, H., Ion source development - ECR test source, 7:32344 (GSI—81-2, pp 247)
See Mueller, M., 7:32322
Schwaccheim, G., *See* de Magalhaes, A.C.N., 7:32826
Schwedt, G., Biogeochemistry of toxic metals, 7:32488
Schwuttke, G.H., *See* Ciszek, T.F., 7:32186
Sciamanna, A., *See* Wilke, C.R., 7:31829
Seabaugh, P.W., *See* Agarwal, A.K., 7:31718
Seah, M.P., Statistical sputtering contribution to resolution in concentration-depth profiles, 7:32291
Seaman, L., *See* McHugh, S.L., 7:31769, 7:31770
Seckert, U., *See* Huber, G., 7:32385
Seeman, S.E., *See* Baird, Q.L., 7:32036
Seidel, B.R., *See* Lambert, J.D.B., 7:32041
Seidel, R.C., Variable gain for a wind turbine pitch control, 7:31898 (DOE/NASA/20320—34)
Sekhposyan, E.V., *See* Amatuni, A.T., 7:32849
Seki, S., *See* Takita, K., 7:32717
Sellvanov, A.E., *See* Abdurakhimov, A.U., 7:32402
Semenov, V.K., *See* Bityukov, S.I., 7:32393
Semenov, Yu.A., *See* Shvachkin, V.B., 7:32449
Senger, P., *See* Kankeleit, E., 7:32384
Senior, I.F., *See* Walsh, R.L., 7:32228
Sephton, A., *See* Armitage, R., 7:32616
Serov, A.Ya., Study on the neutron yield from thick targets under the action of 645 MeV protons, 7:32766 (JINR—18-80-540)
SethuRaman, S., Interaction of the atmospheric boundary layer with large-scale processes over the Bay of Bengal during MONEX79, 7:32472 (BNL—30322)
Setlow, J.K., Transformation of Haemophilus influenzae by recombinant molecules, 7:32545
Setlow, R.B., Measurement of repair synthesis by photolysis of bromouracil, 7:32583
Severud, L.K., Structural considerations and findings from testing of nuclear components (symposium), 1981, 7:32010
Sha, J.Y., *See* Rundo, J., 7:32580
Shablovski, M., *See* Deenski, P.A., 7:32725
Shaked, H., *See* Gurewitz, E., 7:32207, 7:32208, 7:32209, 7:32210
Shampine, L.F., Type-insensitive ODE codes, 7:32925 (SAND—82-0061C)
Shapiro, M.M., *See* Silberberg, R., 7:32733
Shapiro, S.M., *See* Grier, B.H., 7:32820
Sharbaugh, J.E., LMFBR designs for the twenty-first century, 7:31952
Sharp, F.L., *See* Cecco, V.S., 7:32442
Shcherbakov, S.I., Program for calculating the temperature fields in constructive elements of nuclear reactors, 7:31979 (FEI—1019)
Shelley, C.C., *See* Armitage, R., 7:32616
Sheth, A.C., Conversion of alkali metal sulfate to the carbonate, 7:32213
Shiba, M., *See* Kukita, Y., 7:32020, 7:32030, 7:32031
Shibanuma, K., *See* Shibata, T., 7:32895
Shibata, T., Experiment of long pulse beam injection into cryopump, 7:32895 (JAERI-M—9213)
Research report on fuel failure in Mihama Unit 1 nuclear power plant, 7:31927 (KURRI-TR—197)
Shigi, T., Cooling of superconducting magnet with superfluid He, 7:32263
Shimizu, K., Numerical simulation of density evolution in JIPP T-2 tokamak, 7:32865 (IPPJ—483)
Shimizu, M., *See* Takatsu, H., 7:32896
Shimizu, T., *See* Ichikawa, Y.H., 7:32866
Shimony, Y., Metallic interaction in dioxides with rutile and rutile-related structures, 7:32233 (IA—1364, pp 111-112)
Solid state formation of $Y_3Al_5O_{12}$, 7:32172 (IA—1364, pp 110-111)
Shin, H.K., *See* Koh, B.J., 7:31997
Shin, M.C., *See* Koh, B.J., 7:31997
Shin, W.C., *See* Kang, Y.H., 7:31939
Shipilov, V.I., *See* Pevtsov, V.V., 7:32417
Shirai, T., *See* Sataka, M., 7:32704
Shirikova, N.Yu., *See* Solov'ev, V.G., 7:32784
Shkundenkov, V.N., *See* Baranchuk, M.K., 7:32452
Shmelev, V.E., Technological testing of a district heating benchmark at the VK-50 reactor, 7:31958 (NIIAR—15(468))
Shon, K.H., Development of fracture mechanics and related techniques for evaluation of flaws detected during inservice inspection. Part 3, 7:31985 (KAERI/RR—221/80)
See Song, D.H., 7:31922
Shulepin, V.S., Ksub(eff) calculation by the variable separation method, 7:31963 (FEI—1079)
Shumway, R.W., *See* Spore, J.W., 7:32043
Shurov, O.A., *See* Belyaev, V.A., 7:32765
Shvachkin, V.B., Units of reprogramming memory devices in the Camac-Vector systems, 7:32449 (ITEF—112(1980))
Shvetsov, I.K., *See* Dedov, V.B., 7:32191
Shvetsov, Yu.E., *See* Leonchuk, N.P., 7:31980
Siemes, B., *See* Edwin, K.W., 7:32297
Sigalov, V.M., *See* Bykov, A.A., 7:32771
Signell, P., Nucleon-nucleon theory and phenomenology. Progress report and renewal proposal, 7:32723 (DOE/ER/10516—10)
Sikorska, D., *See* Rajewska, A., 7:32840
Silberberg, R., Effects of oscillations on neutrinos generated by cosmic rays in the earth's atmosphere, 7:32733
See Adams, J.H. Jr., 7:32609
Silberg, E., Cd diffusion into PbTe, 7:32211 (IA—1364, pp 110)
Silling, S.A., Method for coupled three-dimensional analysis of reactor vessel blowdowns with internal structures, 7:32054
Sills, T., *See* Bright, R., 7:31834
Silver, G.L., Work diagram for plutonium, 7:32245
Silverman, J.P., *See* Chapin, T.J., 7:32369
Simpson, H.J., *See* Olsen, C.R., 7:32522
Sinclair, P.L., Silicon semiconductors, 7:32454 (SAND—82-0425, pp 7-16)
Singer, E., Side products and pollutants in combustion processes, 7:32493
Singer, R.M., *See* Lambert, J.D.B., 7:32041
Sinha, S.K., *See* Fedro, A.J., 7:32821
Sirotin, A.P., *See* Vagov, V.A., 7:32001
Sistino, A.J., Correlation between results of zone method and experiment in radiative heat transfer, 7:32106
Sitzer, S., Price forecasting in DOE's short-term integrated forecasting system, 7:32077
Sizov, I.V., *See* Bykov, A.A., 7:32771
Skalski, J.R., Statistical evaluation of litterfall data from a forest monitoring study, 7:32498 (PNL-SA—9014)
Skiens, W.E., *See* Burton, F.G., 7:31818
Skorlygin, V.V., *See* Garin, V.P., 7:31946
Skvirenkov, S.V., *See* Khristiansen, G.B., 7:32637
Slamet, S., Numerical simulation of semiconductor devices, 7:32304 (UIUCDCS-R—81-1072)
Slansky, R., *See* Goldhaber, M., 7:32736
Slater, P.J., Code for Dinic's maximum flow algorithm, 7:32923 (SAND—81-1927)
Smilanski, I., *See* Glatt, I., 7:32699
Smirnov, V.I., *See* Ter-Akop'yan, G.M., 7:32411
Smirnova, V.V., *See* Bityukov, S.I., 7:32393
Smith, D.M., *See* Thomas, R.G., 7:32573
Smith, G.A., *See* Llaurado, J.G., 7:32575
Smith, L.F., Atlas of Wolf-Rayet line profiles, 7:32605 (JILA—117)
Smith, P.G., *See* Adkins, C.R., 7:31950
Smith, R.D., *See* Krasniak, S.R., 7:31848

Smyrl, N.R., Vaporization of sediments with a pulsed transverse excitation at atmospheric pressure (TEA) CO_2 laser system, 7:32204 (Y/DK—285)
Snedden, R.B., *See* Pan, Y.S., 7:31742
Snow, G.R., *See* Chapin, T.J., 7:32369
Sobaszek, A., *See* Rajewska, A., 7:32840
Soetono, H., Economics of ethanol in Indonesia, 7:31847 (NP—2902045, pp 25-28)
Soh, J.Y., *See* Shon, K.H., 7:31985
Sokol, E.A., *See* Ter-Akop'yan, G.M., 7:32411
Sokolov, M.M., *See* Avdeev, N.F., 7:32400
Sokolov, M.V., *See* Grantsev, V.I., 7:32416
Sokolov, N.I., *See* Belyaev, V.A., 7:32765
Solov'ev, V.A., Model of diffusion of metals. 2. Effect of polymorphic transformations on self-diffusion parameters, 7:32232 (FEI—1094)
See Rudnev, I.I., 7:32147
Solov'ev, V.G., Collective two-phonon states in deformed nuclei, 7:32784 (JINR-R—4-81-148)
Solovieva, V.I., *See* Khristiansen, G.B., 7:32656
See Kristiansen, G.B., 7:32622
Solyanik, V.I., High resolution Cherenkov counter with liquid radiator, 7:32394 (IFVE-OEF—81-63)
Somorjai, G.A., *See* Watson, P.R., 7:31827
Song, D.H., Experiments and analysis of thermal stresses around the nozzle of the reactor vessel, 7:31922 (KAERI/RR—222/80)
See Shon, K.H., 7:31985
Song, H.K., *See* Song, D.H., 7:31922
Sonin, A.A., Recent research at MIT on fluid-structure interactions, chugging, and scaling laws for SRV discharges, 7:32027 (GKSS—81/E/27, pp II 59-82)
Sonntag, P., Psychology of the nuclear balance, 7:32471
Soule, D.F., *See* Reish, D.J., 7:32532
Soule, J.D., *See* Reish, D.J., 7:32532
Specht, H.J., *See* Walter, P. v., 7:32375
Specker, S.R., *See* Wei, P., 7:31917
Spitznagel, J.A., Irradiation response of materials. Final Quarterly technical progress report, 7:32887 (DOE/ET/52018—16)
Spohr, R., *See* Fischer, B.E., 7:32302
See Hansen, P., 7:32182
See Riedel, C., 7:32381
Spore, J.W., Best estimate radiation heat transfer model developed for TRAN-BD1, 7:32043
Srivastava, V.J., *See* Chynoweth, D.P., 7:31836
Stadler, E., *See* Mingay, D.W., 7:32420
Staiger, P.J., Summary and evaluation of the conceptual design study of a potential early commercial MHD power plant (CSPEC), 7:32109 (DOE/NASA/10769—21)
Stallmann, F.W., Curve fitting and uncertainty analysis of Charpy impact data, 7:31916 (NUREG/CR—2408)
Stang, L.G., Wet powder seal for gas containment, 7:31811
Starace, A.F., *See* Samson, J.A.R., 7:32695
Statham, J.R., *See* Cooper, M.B., 7:32504
Stavinoha, L.L., Accelerated stability test techniques for middle distillate fuels, 7:31756
Army needs for diesel fuel stability and cleanliness, 7:31761
Distillate-fuel stability and cleanliness, 7:31755
Steiff, A., *See* Wiedmann, J.A., 7:32124
Steigerwald, R.L., Investigation of a family of power conditioners integrated into the utility grid: Category 1. Residential power conditioner. Final report, 7:31857 (DOE/ET/29310—1)
Steiner, R., Hall probe applications, 7:32445 (GSI—81-2, pp 246)
See Breitenberger, G., 7:32341
Steinman, D.A., Method and apparatus for determining diameter and wall thickness of minute hollow spherical shells, 7:32162
Stelzer, H., *See* Baden, A., 7:32383
Stelzer, K., *See* Arlt, U., 7:32388
Stenger, V.J., Sensitivity of Dumand arrays to extraterrestrial neutrino fluxes, 7:32434
Stephens, C.A., *See* Hirasuna, A.R., 7:31894
Stephenson, I., *See* Orford, K.J., 7:32647
Stephenson, R., *See* Bateman, J.E., 7:32421
Stephenson, W.A., PFN tool test and calibration system, 7:31781 (SAND—80-0064)
Stern, B.E., *See* Dedenko, L.G., 7:32750
Sternberg, Y., *See* Silberg, E., 7:32211
Stewart, K.B., *See* Hann, C.R., 7:32017
Sticker, H., *See* Chapin, T.J., 7:32369
Stieber, A., Fuel oil distributor's experience with contaminated No. 2 fuel oil, 7:31759
Stiebing, K.E., *See* Schadt, W., 7:32379
Stiehl, H., *See* Baumann, H., 7:32180
Stoesel, R., *See* Diel, R., 7:32097
Stokes, G.M., Global CO_2 buildup and possible climate modification, 7:32480 (PNL-SA—9311)
Stokes, R.H., *See* Crandall, K.R., 7:32326
Storch, N.A., Applying structured analysis in a real-time data acquisition environment, 7:32928 (UCRL—86341)
Storm, D., *See* Drake, D.M., 7:32795
Strain, R.V., *See* Lambert, J.D.B., 7:32041
Strambi, A., *See* Strambi, C., 7:32550
Strambi, C., Radioimmunoassay of insect juvenile hormones and of their diol derivatives, 7:32550
Strand, J.A., *See* Mercer, B.W., 7:31730
Straume, T., Implications of new Hiroshima and Nagasaki dose estimates: cancer risks and neutron RBE, 7:32574
Strehl, P., New emittance measuring device of the Unilac, 7:32336 (GSI—81-2, pp 237)
See Angert, N., 7:32315
See Fradj, M., 7:32337
See Geissel, H., 7:32808
See Losert, W., 7:32444
See Wilms, D., 7:32340
Strenge, D.L., Simplified evacuation model for estimating mitigation of early population exposures, 7:32572 (PNL-SA—9133)
Strizh, T.A., *See* Badalyan, S.G., 7:32410
See Govorun, N.N., 7:32409
Strniste, G.F., Sunlight activation of shale-oil byproducts as measured by genotoxic effects in cultured Chinese hamster cells, 7:32587 (LA-UR—81-3204)
Strokach, A.P., Prospects of ion hydride application in negative hydrogen ion sources, 7:32898 (NIIEFA-P-K—0470)
Strokakh, A.P., *See* Komarov, V.L., 7:32899
Strottman, D., *See* Kapusta, J., 7:32803
Stroup, E.D., *See* Andrews, J., 7:32430
Struckmeier, J., *See* Holzschuh, G., 7:32324
See Klabunde, J., 7:32319
Strugalski, Z., Hadron-nucleon inelastic collision mean free path in nuclear matter, 7:32777 (JINR—E-1-80-799)
Hadron-nucleus collisions. Pt. 1. Picture, description procedure, cross-sections, 7:32778 (JINR—E-1-81-154)
Strutt, R.B., *See* Armitage, R., 7:32616
See Blake, P.R., 7:32618
Struzhko, B.G., *See* Grantsev, V.I., 7:32416
Stubblefield, F.W., *See* Alberi, J.L., 7:32327
Stuk, G.P., *See* Baranchuk, M.K., 7:32452
Such, H.C., Nuclear fuel design. Design and fabrication of a CANDU-600 fuel 3-element bundle for an irradiation test, 7:31941 (KAERI/RR—242/80)
Suga, K., *See* Inoue, N., 7:32640
See Kakimoto, F., 7:32629
Sugama, T., Water-compatible polymer concrete materials for use in rapid repair systems for airport runways. Final report, 7:32177 (BNL—51390)
Sugawa, N., *See* Inoue, N., 7:32640
See Tamura, T., 7:32619
Sugawara, H., *See* Ikeda, H., 7:32734
Suh, D.W., Apparatus for the isotope separation, 7:31786 (KAERI/RR—256/80)
Suh, K.S., Establishing QC/QA system in the fabrication of nuclear fuel assemblies, 7:31994 (KAERI/RR—245/80)
See Lee, G.S., 7:31926
See Such, H.C., 7:31941
Suh, K.W., *See* Ha, C.W., 7:32415
Sullivan, J.C., *See* Wester, D.W., 7:32240
Sullivan, L.D., Coal-fired open cycle MHD combustion plasmas: chemical equilibrium and transport properties workshop results, 7:32107
Sumerling, T.J., Statistical aspects of the interpretation of counting experiments designed to detect low levels of radioactivity, 7:32418 (NRPB-R—113)
Sumin, V.V., *See* Danilkin, S.A., 7:32171
Sun, R.J., Site selection and investigation for subsurface disposal of radioactive wastes in hydraulically induced fractures, 7:31810 (USGS-OFR—80-450)
Sung, N.J., *See* Suh, D.W., 7:31786
Suresh, S., *See* Ritchie, R.O., 7:32142
Suryoutomo, H., Dynamic analysis techniques--a sensitivity study for piping systems at a nuclear power plant, 7:32065
Sutherland, J.C., Synchrotron radiation sources for photobiology and ultraviolet, visible and infrared spectroscopy, 7:32424
Suvorov, V.D., *See* Bakov, A.T., 7:31999
Suzuki, A., *See* Ikeda, H., 7:32734
Suzuki, I., *See* Arinobu, M., 7:32024
Suzuki, N., *See* Sakuyama, H., 7:32665
Swanson, D., *See* McBrayer, J.D., 7:31886
Swanson, J.L., Effect of organic complexants on the mobility of low level waste radionuclides in soils, 7:31805 (PNL-SA—10019)

Swindeman, R.W., Variability of data--standards for applications, 7:32247
Swoboda, C.A., Solid-state high common-mode battery cell voltage scanner: design report, 7:32127 (ANL/OEPM—81-7)
Sychev, B.S., *See* Serov, A.Ya., 7:32766
Sze, R.C., XeCl avalanche discharge laser employing Ar as a diluent, 7:32265
Szedon, J.R., Development of copper sulfide/cadmium sulfide thin-film solar cells, 7:31851 (SERI/PR—8143-1-T5)
Szewczyk, A.F., Investigation of the tensile deformation and fracture of a dual-phase steel, 7:32143 (DOE/ER/10556—86)

T

Tagart, S.W., *See* Bohm, G.J., 7:31919
Takagaki, M., *See* Ishida, M., 7:32571
Takahashi, T., *See* Higaski, S., 7:32685
Takatsu, H., Detailed analysis of the dynamic behavior of the JT-60 vacuum vessel under the saddle-like electromagnetic forces, 7:32896 (JAERI-M—9242)
Takeshita, I., *See* Kukita, Y., 7:32020, 7:32030, 7:32031
Takeuchi, K., Analysis of HDR blowdown experiment for fluid-structure interactions, 7:32055
Evaluation of incompressible hydrodynamic mass methods in reactor applications, 7:32056
Takita, K., Observation of surface dissociation of HgTe crystal by means of 42MeV-O^{3+} backscattering, 7:32717
Takizuka, T., Computational studies of tokamak plasmas, 7:32873 (JAERI-M—9354)
Tamura, T., Arrival time distribution of muons in large air showers observed at 900m above sea level, 7:32619
Proceedings of the 1979 seminar on nuclear data, 7:32763 (JAERI-M—8769)
See Inoue, N., 7:32640, 7:32641
Tanahashi, G., *See* Jogo, N., 7:32654
Tanaka, M., Computer simulation on microinstabilities and anomalous resistivity near the magnetic neutral sheet, 7:32869 (IPPJ—487)
Tang, Y.H., *See* Jogo, N., 7:32654
Tangnu, K., *See* Wilke, C.R., 7:31829
Tanzer, F., Computer aided extractor design for the RIG 10 high intensity ion source, 7:32328 (GKSS—80/E/33)
Taran, Yu.V., *See* Nikitenko, Yu.V., 7:32002
Tarasova, T.I., *See* Dedov, V.B., 7:32191
Tarasova, V.N., *See* Buttseva, G.L., 7:32408
Tarman, P.B., *See* Chynoweth, D.P., 7:31836
Tasaka, K., *See* Ihara, H., 7:32776
See Yamano, K., 7:32029
Teicher, K., *See* Foroughi, M., 7:32503
Telyatnikov, V.A., *See* Bakov, A.T., 7:31999
Temple, J.A.G., Calculations of the reflection and transmission of ultrasound by rough sodium-filled defects in steel, 7:31942 (AERE-R—10095)
Tenenbaum, J., *See* Lotem, H., 7:32850
Teodorescu, D., Optoelectronic display units - status and trends, 7:32460
Ter-Akop'yan, G.M., Neutron detector for detecting rare events of spontaneous fission, 7:32411 (JINR-R—13-81-18)
See Oganesyan, Yu.Ts., 7:32792
See Orlova, O.A., 7:32790
Terasawa, T., Numerical study of explosive tearing mode instability in one-component plasmas, 7:32868 (IPPJ—486)
Tereshkina, L.G., *See* Belyaev, V.A., 7:32765
Tessier, M.J., *See* Neely, H.H., 7:32034
Testart, E., Mechanical properties and structure of rapidly solidified high-titanium-stabilized 316 stainless steel, 7:32139 (DOE/ER/10107—5)
Teterev, Yu.G., *See* Belov, A.G., 7:32196
Tezuka, H., Sigma model in many body problem, 7:32739 (INS—393)
Thiel, K., TL-studies of ion-implanted CaF_2, 7:32181 (GSI—81-2, pp 173)
Thode, E.F., *See* Heaton, R.C., 7:31728
Thoe, R.S., *See* Overbury, S.H., 7:32714
Thomas, J.R., *See* Hurt, S.S., 7:32004
See Hurt, S.S. III, 7:32005, 7:32007
Thomas, K., *See* Ogard, A., 7:32535
Thomas, R.E., *See* Guo, K.J., 7:31887
Thomas, R.G., Pulmonary tumours in Syrian hamsters following inhalation of $^{238}PuO_2$, 7:32573
Thomas, T.M., *See* Carlson, T.A., 7:32713
Thompson, B.J., *See* Wever, G.H., 7:32565
Thornton, G.J., *See* Liebing, D.F., 7:32636
Thurman, A.L., 3-D finite element analysis for the investigation of feedwater line cracking in PWR steam generators, 7:32050
Tien, J.K., Deuterium plasma-material wall interactions. Final report, 1 May 1979-30 September 1981, 7:32886 (DOE/ET/52008—2)
Tikhinskii, G.F., *See* Karpov, E.S., 7:32155
Tillery, M.L., *See* Fairchild, C.I., 7:32484
Tilley, R.M., *See* Wei, P., 7:31917
Timmerman, C.L., Liquid-waste immobilization by agglomeration, 7:31804 (PNL-SA—9739)
Tischer, R.E., Preparation of bimodal aluminas an molybdena/alumina extrudates, 7:31721
Tizengauzen, V.A., *See* Chudakov, A.E., 7:32676
Toba, Y., Strong sequential transfer processes in $O^+ \rightarrow O^+$ (p,t) reactions on Pb isotopes, 7:32791 (UTTAC—39)
See Kunori, S., 7:32782
Tokareva, T.I., *See* Yur'ev, Yu.S., 7:31991
Tokuda, S., *See* Takizuka, T., 7:32873
Tolle, A., *See* Heeschen, W., 7:32499
Tomassian, R., *See* Lebey, J., 7:31977
Tompkins, R.E., *See* Steigerwald, R.L., 7:31857
Tone, T., One-dimensional transport code for the simulation of D-T burning tokamak plasma. POISE 1, 7:32872 (JAERI-M—9167)
Toneev, V.D., *See* Gudima, K.K., 7:32800
Tong, T., *See* Wen, C.Y., 7:31716
Toplosky, J., *See* Ritchie, R.O., 7:32142
Torma, A.E., *See* Brierley, J.A., 7:31784
Tosteson, T.R., *See* Sasscer, D.S., 7:31864
Toth, L.M., Polymerization of Pu(IV) in aqueous nitric acid solutions, 7:32241
Townsend, D.B., *See* Wei, P., 7:31917
Trajkova, M.D., *See* Deenski, P.A., 7:32725
Trautmann, H., *See* Holzschuh, G., 7:32324
See Klabunde, J., 7:32319
Trautmann, N., Preparation of ^{248}Cm sources for experiments with heavy ions, 7:32347 (GSI—81-2, pp 186)
See Greulich, N., 7:32190
See Mazumdar, A.K., 7:31824
Tretyakova, M.I., *See* Maslennikova, N.U., 7:32735
Troncone, L., *See* Galli, G., 7:32555
Trowbridge, C.W., Three dimensional field computation, 7:32846 (RL—81-054)
Trukhlyaev, P.S., *See* Dedov, V.B., 7:32191
Trykov, O.A., Experimental study of specific fluorescence features of organic scintillators during their interactions with fast neutrons and gamma-quanta, 7:32372 (FEI—1099)
Trzeciak, K., *See* Popov, A.B., 7:32783
Tsallis, C., Conjecture on the critical frontier of the fully anisotropic homogeneous quenched bond-mixed potts ferromagnet in square lattice, 7:32178 (CBPF-NF—023/80)
Conjecture on the critical frontier of the ferromagnetic Potts model on planar lattices, 7:32179 (CBPF-NF—029/80)
Random magnetism, 7:32825 (CBPF-A—0010/80)
See de Magalhaes, A.C.N., 7:32826
Tsang, K.T., Stability of low-frequency modes in tandem mirrors and bumpy tori, 7:32877 (SAI—254-81-387-LJ)
Tsao, C.H., *See* Adams, J.H. Jr., 7:32609
Tschoeke, H., *See* Moeller, R., 7:31947
Tsehrehndulam, D., *See* Buttseva, G.L., 7:32408
Tsetlin, M.B., Study of the tunnel junctions on vanadium base, 7:32149 (IAE—3338/10)
Tsovbun, V.I., *See* Komochkov, M.M., 7:32414
Tsunematsu, T., *See* Takizuka, T., 7:32873
Tsupko-Sitnikov, V.M., *See* Volkov, N.G., 7:32403
See Zuber, K., 7:32780
Tsuruta, T., *See* Ishida, M., 7:32571
Tu, K.N., *See* Grimaldi, M.G., 7:32426
Tumakov, V.I., *See* Bozhko, N.I., 7:32396
Tupper, R.B., Development of a self-actuated shutdown system, 7:32038
Turner, F.B., Environmental effects of solar thermal power systems: ecological observations during construction of the Barstow 10 MWe pilot STPS, 7:31863 (UCLA—12/1311)
Turner, M.S., *See* Kolb, E.W., 7:32607
Turner, R.F., US/FRG umbrella agreement for cooperation in GCR development. Fuel, fission products, and graphite subprogram. Quarterly status report, July 1, 1981-September 30, 1981, 7:31937 (GA-A—16558)
Turver, K.E., *See* Andam, A.A., 7:32628, 7:32649, 7:32650
See Chantler, M.P., 7:32648
See Gibson, A.I., 7:32617
See McComb, T.J.L., 7:32651
See Orford, K.J., 7:32647
Tutyshkina, L.V., *See* Baranchuk, M.K., 7:32452

Tyrkova, I.A., Classical transfer coefficients in a plasma with impurities, 7:32853 (IAE—3309/6)

U

Uebing, D., Reliability and availability of power plant systems, 7:32296
Ueno, S., *See* Poon, P.T.Y., 7:32816
Ullrich, R.L., *See* Witschi, H., 7:32585
Ulm, G., *See* Huber, G., 7:32385
Ulrichs, J., *See* Bray, A.D., 7:32615
Unruh, C.M., Environmental effects of reactor waste disposal alternatives, 7:31801 (PNL-SA—8604)
Uspanova, G.Sh., *See* Buttseva, G.L., 7:32408
Ustenko, E.P., *See* Pozharskii, A.V., 7:32405

V

Vagov, V.A., Measuring module of spectrometer of neutron small angle scattering on the IBR pulse reactor, 7:32001 (JINR-R—10-80-826)
Valdes, A., *See* Almanza, R., 7:31880
Valdez, V.A., Visualization of the liver with sup(99m)Tc-EHDP in thalassemia major, 7:32552
Vallin, C., Experimental analysis of a nuclear reactor prestressed concrete pressure vessels model, 7:31983 (INIS-mf—6770)
Valov, N.I., *See* Barnaulova, T.V., 7:32398
van der Hoeven, W.B., *See* Eknoyan, O., 7:31883
van der Hucht, K.A., Iron curtain of the WC9 star HD 164270, 7:32682
van Drunen, G., *See* Cecco, V.S., 7:32442
Van Sciver, S. W., Stabilization of large superconducting magnets in superfluid helium. Heat transfer aspects, 7:32264
Van Stijgeren, E., Current topics in piping and pipe support design (symposium), 1981, 7:32061
Van Winkle, W., *See* Boreman, J., 7:32526
Vance, S.W., *See* Bratina, J.E., 7:31746
Vander Sande, J.B., *See* Arnberg, L., 7:32140, 7:32881
See Megusar, J., 7:32137, 7:32882
Vanderborgh, N.E., Synthesis of hydrocarbons in the earth's crust, 7:31750 (LA—8983)
Vaniman, D.T., *See* Erdal, B.R., 7:31795
Vansteenkiste, P., Avoiding static charges in filter materials by using metal fibres, 7:32301
Vant-Hull, L.L., Solar energy systems simulation and analysis. 2nd quarterly progress report, January 1-March 31, 1980, 7:31861 (DOE/SF/10763—T13)
Vartapetyan, G.A., *See* Adamyan, F.V., 7:32370
See Arustamyan, G.V., 7:32371
Vasconcellos, M.B.A., Comparative study of some methods for the determination of uranium used at the Instituto de Pesquisas Energeticas e Nucleares, 7:32193 (IPEN-Pub—17)
Vasudevan, R., *See* Lee, E.S., 7:32932
Vaughn, D.S., *See* Boreman, J., 7:32526
Vavilov, Y.N., *See* Abdrashitov, S.F., 7:32661
Ve sman, U.K., *See* Barnaulova, T.V., 7:32398
Venkateswarlu, K.S., *See* Noronha, O.P.D., 7:32558
Venter, F., Relation between the location and the heavy metal contents of vegetables, 7:32501
See Foroughi, M., 7:32503
Vermey, A., *See* Hoving, J., 7:32559
Vertebnyj, V.P., *See* Andrzejewski, J., 7:32779
Vest, R.W., Thick film materials and discrete passive components, 7:32467 (SAND—82-0425, pp 69-80)
Vikhrev, V.V., Transport processes in a tokamak with adiabatic compression. Mathematical model and first-stage calculating results, 7:32854 (IAE—3321/8)
Vilhjalmsson, H., *See* Losert, W., 7:32444
Villman, Ch.I., *See* Barnaulova, T.V., 7:32398
Vine, E.N., Radionuclide transport and retardation in tuff, 7:32523
Vinogradova, I.S., ^{2}D and ^{133}Cs NMR study of the hydrogen bond network and antiferroelectric phase transition of cesium trihydrogen selenite, 7:32214
Vladimirov, V.V., *See* Trykov, O.A., 7:32372
Vo Khong An, Problem of neutron spectroscopy of parametrically nonequilibrium quasiparticles in solids. Pt. 1. Neutron inelastic scattering on polaritons in the parametric resonance conditions, 7:32812 (JINR—E-17-81-60)
Vo Kim Tkhan, *See* Andrzejewski, J., 7:32779
Vogel, W.G., Guide for revegetating coal minesoils in the Eastern United States, 7:31729 (PB—81-245011)
Vogt, D., *See* Wolf, B.H., 7:32316
Vogt, O., *See* Buyers, W.J.L., 7:32819
Voigt, B., *See* Fengler, G., 7:31910
Volke, F., *See* Klose, G., 7:32843
Volkov, G.A., *See* Avdeev, N.F., 7:32400
Volkov, N.G., "PROSPEC" computer program complex for automatic processing of multidimensional gamma-gamma coincidence spectra, 7:32403 (JINR—10-81-159)
Volkov, V.A., *See* Bakov, A.T., 7:31999
Voltolini, Ch., *See* Aguilar-Benitez, M., 7:32395
von Arx, A.V., Method of analysis of CRBRP transients for the steam generator, 7:32035
Vorob'ev, T.A., *See* Kozlov, F.A., 7:31945
Voronkov, G.G., *See* Shmelev, V.E., 7:31958
Vorozhtsov, S.B., *See* Borisovskaya, Z.V., 7:32914
Vovenko, A.S., *See* Bozhko, N.I., 7:32396
Vtyurin, V.A., *See* Andrzejewski, J., 7:32779
Vukovich, F.M., Virgin Islands wind energy siting analysis. Final report, 7:31897 (SSEC/TP—31262, pp 76p, Report A)
Vuolo, J.H., *See* do Nascimento, I.C., 7:32888

W

Wadati, M., *See* Ichikawa, Y.H., 7:32866
Wagner, H., *See* Mazumdar, A.K., 7:31824
Wagner, I., *See* Denes, E., 7:32406
Wagner, P., *See* Heaton, R.C., 7:31728
Wagner, S.E., Seismic design of deadweight supports, 7:32062
Wahlen, H., Structure functions in deep inelastic lepton nucleon scattering, 7:32731 (SLAC—245, pp 663-683)
Wakamiya, W., *See* Mercer, B.W., 7:31730, 7:31776
Walcher, W., *See* Mazumdar, A.K., 7:31824
Walker, F.E., TAAMM submunition project. Monthly progress report No. 8, July 1-31, 1979, 7:32469 (UCID—18253)
Walker, J.F., *See* Patton, B.D., 7:32527
Walker, R., Measurement of the elongate rate from 2×10^{17} - 10^{20}eV, 7:32620
Walley, G.M., *See* Andam, A.A., 7:32628, 7:32649, 7:32650
See Chantler, M.P., 7:32648
See Orford, K.J., 7:32647
Walsh, R.L., Preparation of thin targets of ^{239}Pu, ^{233}U and ^{235}U by the method of electrospraying, 7:32228 (AAEC/E—512)
Walter, P. v., Computerized electronics for nuclear research, 7:32375 (GSI—81-2, pp 212)
Walter, U., Distribution of cyclic-GMP-dependent protein kinase in various rat tissues and cell lines determined by a sensitive and specific radioimmunoassay, 7:32549
Walton, J.J., *See* Penner, J.E., 7:32481
Wambach, U., *See* Wiemers, M., 7:32334
Wambsganss, M.W., *See* Halle, H., 7:32257
Wampler, W.R., *See* Picraux, S.T., 7:32906
See Roth, J., 7:32908
Wanek, P.L., *See* Heaton, R.C., 7:31728
Wang, K.M., *See* Lee, E.S., 7:32932
Wangen, L.E., *See* Heaton, R.C., 7:31728
Wangler, T.P., *See* Crandall, K.R., 7:32326
Warren, L.F., *See* Noufi, R., 7:31853
Warwick, A.I., *See* Baden, A., 7:32383
Wasito, K., Propsects for ethanol in Indonesia, 7:31846 (NP—2902045, pp 19-24)
Watase, Y., Present experiments at KEK 12 GeV PS, 7:32726 (KEK—79-33, pp 211-241)
Watson, A.A., *See* Coy, R.N., 7:32623
See Walker, R., 7:32620
Watson, P.R., Hydrogenation of carbon monoxide over rhodium oxide surfaces, 7:31827
Wdowczyk, E., *See* Chudakov, A.E., 7:32676
Weaver, H.J., TRANSF code user manual, 7:32927 (UCID—19268)
Webb, R.C., *See* McIntyre, P.M., 7:32358
Weber, G., *See* Nagel, K., 7:32066
Weber, H., *See* Best, K.J., 7:32844
Weber, M.J., Optical properties of Nd^{3+} in metaphosphate glasses, 7:32187
Weers, C.A., Multi trace element analysis of dry biological materials by neutron activation analysis including a chemical group separation, 7:32192 (INIS-mf—6831)
Wei, C.Y., *See* Zhuang, J., 7:32176

Wei, P., Boiling water reactor uranium utilization improvement potential, 7:31917 (ORNL/SUB—7537/15)
Weichold, M.H., *See* Eknoyan, O., 7:31883
Weik, F., Improvements to the multi on-line analysis system, 7:32377 (GSI—81-2, pp 214)
See Baden, A., 7:32383
Weiland, P., Measurement of bubble size distributions in fermentation media using a photoelectric probe, 7:32464
Weimer, W.C., *See* Felix, W.D., 7:31747
Weinspach, P.M., *See* Wiedmann, J.A., 7:32124
Weinstein, M., Recent results in lattice gauge theories, 7:32757 (SLAC—245, pp 513-533)
Wells, F.H., Design principles for radiological protection instrumentation systems, 7:32367 (AECP—8(Pt.2))
Welter, H., *See* Biskamp, D., 7:32856
Wen, C.Y., Optimization studies of various coal-conversion systems. Quarterly report Nos. 1 and 2, May 1, 1981-July 13, 1981 and August 1, 1981-October 31, 1981, 7:31716 (DOE/PC/40778—T1)
Wender, S.A., *See* Drake, D.M., 7:32795
Wenderoth, O., Contribution to the investigation of the STROUHAL number of high structures in natural wind for very high Reynolds numbers, 7:31901 (NP—2901105)
Wengert, N., *See* Hamilton, M.S., 7:31911
Werner, A., *See* Debray, D., 7:32165
Westbrook, S.R., *See* Stavinoha, L.L., 7:31756, 7:31761
Wester, D.W., Electrochemical and spectroscopic studies of neptunium(VI), -(V) and -(IV) in carbonate-bicarbonate buffers, 7:32240
Westwater, J.W., *See* Woodruff, D.W., 7:32260
Wever, G.H., T4 head assembly and high temperature, 7:32565
Weyand, M., *See* Gappisch, M., 7:32261
Whang, C.K., *See* Suh, D.W., 7:31786
Whitaker, R., Trade-offs in NO/sub x/ control, 7:32311
White, D.H., Geothermal Development Plan: Pima County, 7:31881 (DOE/RA/50076—T12)
White, E.W., *See* Boyle, J.F., 7:31760
See Brinkman, D.W., 7:31828
See Garner, M.Q., 7:31758
White, J., *See* Noufi, R., 7:31853
White, J.R., Analysis of the lumped fission-product uncertainty in CRBR, 7:31943 (CONF-811103—69)
White, S.N., *See* Chapin, T.J., 7:32369
Wiberg, J.S., *See* Wever, G.H., 7:32565
Wiechen, A., Transfer from vegetation to milk, 7:32518 (INIS-mf—6902, pp v)
Wieczenski, D.E., *See* Pan, Y.S., 7:31742
Wiedemann, H., Linear colliders: a preview, 7:32356 (SLAC—245, pp 313-353)
Wiedmann, J.A., Investigation of power consumption, suspension and flooding characteristics of stirred, aerated slurry reactors, 7:32124
Wielunski, L., *See* Grimaldi, M.G., 7:32426
Wiesaan, H., *See* Baden, A., 7:32383
Wiemers, M., Process control of the UNILAC, 7:32334 (GSI—81-2, pp 228)
Wieser, P., Application of LAMMA in aerosol research, 7:32487
Wild, J.F., *See* David, F., 7:32243
Wildman, D.J., *See* Pan, Y.S., 7:31742
Wiley, D., *See* Wilke, C.R., 7:31829
Wiley, J.D., *See* Guo, K.J., 7:31887
Wilhelm, K., Electroplating workshop, 7:32219 (GSI—81-2, pp 233)
Wilke, C.R., Enzymatic hydrolysis of cellulose: theory and applications, 7:31829 (LBL—13669)
Willbanks, E.W., *See* Collins, W.W., 7:32919
Wille, P., Interlaboratory niobium dosimetry comparison. The contribution of the GKSS-Forschungszentrum Geesthacht, 7:32374 (GKSS—80/E/36)
Williams, D.M., *See* Kubitschek, H.E., 7:32592
Williams, G.A., *See* Cooper, M.B., 7:32504
Williams, J.M., *See* Coltman, R.R. Jr., 7:32163
See Heaton, R.C., 7:31728
Williams, J.R., *See* Hocking, G., 7:31806
Willis, A.J., Velocity characteristics of WR stellar winds, 7:32681
Wilms, D., μP-control of rf-systems at the Unilac, 7:32340 (GSI—81-2, pp 241)
See Angert, N., 7:32315
See Losert, W., 7:32444
Wilson, B.W., *See* Felix, W.D., 7:31747
Wilson, J.R., *See* Alonso, C.T., 7:32606
Wilson, K.L., *See* Bohdansky, J., 7:32167
Wilson, N.G., *See* Hansborough, L.D., 7:32325
Wincel, H., *See* Wlodek, S., 7:32223
Winkler, M.A., Radiographic techniques for investigating cereal grains, 7:32566
Winn, M.M., *See* Bray, A.D., 7:32615
Winston, R., Engineering development studies for integrated evacuated CPC arrays. Interim technical progress report, 7:31876 (DOE/AL/16223—1)
Fundamentals and techniques of nonimaging optics for solar-energy concentration. Annual progress and status summary, 7:31878 (DOE/ER/10575—2)
Winter, N.W., *See* Flannery, M.R., 7:32712
Wirstad, J., Knowledge structures for process operators, 7:31954 (ERGONOMRAAD-R—18)
Wirth, E., Problem of the validity of a specific activity model for tritium, 7:32533 (INIS-mf—6902, pp v)
Status report - transfer of C-14 from air to humans, 7:32507 (INIS-mf—6902, pp v)
Wirth, H.L., *See* Baumann, H., 7:32180
Wirth, V.A. Jr., *See* Price, T.W., 7:32129
Wiscombe, W., *See* Hoffert, M., 7:32473
Wise, R.K., *See* Lewis, J.H., 7:32018
Witschi, H., Pathogenetic mechanism in lung fibrosis, 7:32585
Wittmann, F.J., Quality assurance through jurisdiction, 7:32286
Wittmayer, F.J., *See* Hsieh, E.J., 7:31822
Wlodek, S., Gas phase negative ion reactions on electron irradiation of NO_2, 7:32223 (INR—1746/17/C/A)
Wo Fan, Separation of volatile superheavy elements from copper catchers, 7:32189 (GSI—81-2, pp 188)
Wogman, N.A., Design and environmental applications of an ultra-low-background, high-efficiency intrinsic Ge gamma-ray spectrometer, 7:32200 (PNL-SA—8945)
Wolf, A., *See* Reivich, M., 7:32540
Wolf, B., *See* Mueller, M., 7:32322
Wolf, B.H., 300 kV accelerator, 7:32316 (GSI—81-2, pp 249)
Wolf, G.K., *See* Santosa, S., 7:32148
Wolfer, W.G., Prediction of the behavior of structural materials under irradiation through modeling of the microstructure. Progress report, November 1, 1980-October 31, 1981. Final report, 7:32136 (DOE/ER/04861—3)
Wolfsberg, K., *See* Erdal, B.R., 7:31795
See Vine, E.N., 7:32523
Wollers, I.K., Recent findings in the sinking of shafts using rod-less shaft boring machines, 7:31737 (DOE-tr—249)
Wollnik, H., *See* Dersch, G., 7:32349
Wolosin, S., *See* Mogul, J., 7:31907
Wolters, R.A., *See* Wei, P., 7:31917
Won, S.Y., *See* Lee, Y.W., 7:32032
Wong, H., *See* Wilke, C.R., 7:31829
Wong-Chong, G.M., *See* Bratina, J.E., 7:31746
Wood, S., *See* Spitznagel, J.A., 7:32887
Woodard, L.M., *See* Barkman, W.E., 7:32255
Woodruff, D.W., Steam condensation on various gold surfaces, 7:32260
Woodruff, P.R., Photoionization of helium to He^+ (n = 2), 7:32694 (DOE/ER/02892—29)
Worschech, R., *See* Neumann, H., 7:32013
Wotring, W.T., *See* Powers, E.J., 7:31764
Wray, W.O., Passive solar retrofit study for the United States Navy, 7:31869 (LA—9071-MS)
Wu, B.J.C., *See* Saha, P., 7:32045
Wu, S.L., Recent e^+e^- results from PETRA, 7:32365 (SLAC—245, pp 536-567)
Wu, X., *See* Ma, Z., 7:32802
Wurster, R., *See* Wieser, P., 7:32487
Wyrobek, A.J., Sperm assays in man and other mammals as indicators of chemically induced testicular dysfunction, 7:32588

Y

Yagafarova, V.M., *See* Buttseva, G.L., 7:32408
Yakimenko, I.P., Ifluence of the collisions of electrons and ions with atoms and molecules on the dynamic form-factors of bounded many-particle systems, 7:32871 (ITP—80-108-E)
Yamamoto, J., *See* Shigi, T., 7:32263
Yamamoto, N., *See* Kukita, Y., 7:32030, 7:32031
Yamamoto, R.K., High energy hadron physics with the FNAL Hybrid bubble chamber system, 7:32742 (KEK—79-33, pp 74-140)
Yamamoto, S., *See* Higaski, S., 7:32685
Yamano, K., LFTPLT8: plotter program for RELAP5 code, 7:32029 (JAERI-M—9359)
Yang, K.R., Study on the neutron activation analysis, 7:32199 (KAERI/RR—272/80)

Yanushevich, I.V., *See* Garin, V.P., 7:31946
Yao, N.P., *See* Swoboda, C.A., 7:32127
Yates, L.P., *See* Lloyd, W.G., 7:31726
Yellin, N., *See* Silberg, E., 7:32211
Yesavage, V.F., Phase equilibrium properties of coal derived liquids. Technical progress report, July-December 1981, 7:31725 (DOE/PC/30230—23)
Yoder, J.A., *See* Paffenhoefer, G.A., 7:32603
Yokoi, C.S.O., Ising model with competing axial interactions in the presence of a field, 7:32834 (IFUSP-P—239)
Yoshida, T., *See* Ihara, H., 7:32776
Yoshino, K., Dielectric breakdown in liquid helium, 7:32721
Yost, F.G., Tearing during pinch-off of Rolamite fill tubes, 7:32160 (SAND—81-1952)
Yu, G.P., *See* Harling, O.K., 7:32141
Yu, L.C., *See* Carrano, A.V., 7:32544
Yu, M.W., *See* Lee, Y.W., 7:32032
Yuk, K.H., *See* Nahm, K.J., 7:31940
Yur'ev, Yu.S., Synthesis of porous vortex free bodies as a hydrodynamical design problem, 7:31991 (FEI—1095)
Yurchenko, E.I., *See* Vikhrev, V.V., 7:32854
Yushmanov, P.N., *See* Tyrkova, I.A., 7:32853
Yuzhanin, V.I., *See* Shmelev, V.E., 7:31958

Z

Zabelin, A.I., *See* Shmelev, V.E., 7:31958
Zabriskie, W.L., *See* Hardy, J.E., 7:31929
Zagorodny, A.G., *See* Yakimenko, I.P., 7:32871
Zakurkin, V.V., *See* Danilkin, S.A., 7:32171
See Morozov, S.I., 7:32807
Zamyatnin, Yu.S., *See* Belov, A.G., 7:32196
Zaneveld, R., *See* Andrews, J., 7:32430
Zanevskii, Yu.V., Pressurised position sensitive detector for gamma detection, 7:32413 (JINR-R—13-81-298)
Zardecki, A., *See* Gerstl, S.A.W., 7:32474
Zaritskaya, T.S., Combined iterative method for calculating the fuel burnup in nuclear reactors. Single-step kinetics, 7:31921 (ITEF—122(1980))
Zatsepin, V.I., *See* Deshurko, M.D., 7:32608
Zayachki, V.J., *See* Deenski, P.A., 7:32725
Zeidler, A., *See* Dahl, L., 7:32338
Zenkevich, P.R., *See* Koshkarev, D.G., 7:32893
Zhang, J., *See* Ma, Z., 7:32802
Zheleznykh, I.M., *See* Dedenko, L.G., 7:32750
Zhidkov, N.K., *See* Deenski, P.A., 7:32725
Zhigunov, V.P., Inverse problem and account of the instrument resolution function, 7:32448 (IFVE-ONF—81-5)
Zhuang, J., Order-disorder transition in Sr_3IrD_5: evidence for square pyramidal IrD_5 units from powder neutron diffraction data, 7:32176
Zhuchko, V.E., *See* Belov, A.G., 7:32196
See Gangrskii, Yu.P., 7:32786
Zhuk, V., *See* Budzynski, M., 7:32154
Zhukov, G.P., *See* Vagov, V.A., 7:32001
Zhuo, Y., *See* Ma, Z., 7:32802
Ziegert, W., *See* Mazumdar, A.K., 7:31824
Zielinski, R.E., *See* Agarwal, A.K., 7:31718
Zillmann, J., Safety in nuclear engineering by means of nondestructive testing, 7:32042
Zimmermann, H., Investigations on swelling of U-PU mixed carbide, 7:32173 (KFK—3078)
Zipfel, P.F., DNA turnover in nonproliferation tissues, 7:32546
Zoellner, R., *See* Zipfel, P.F., 7:32546
Zschornack, G., *See* Muller, G., 7:32705
Zubarev, A.L., *See* Belyaev, V.B., 7:32706
Zuber, K., ^{149}Dy beta decay and ^{149}Tb excited states, 7:32780 (JINR-R—6-81-23)
Zweig, K., *See* Langenbeck, B., 7:32350

SUBJECT INDEX

The subject index is based on the use of subject descriptors selected from a controlled thesaurus of terms. Subject descriptors and qualifiers (subheadings) are selected and presented in the following format:

SUBJECT DESCRIPTOR
Qualifier
Title, (supplementary information), citation number, (report number)

The title may be supplemented with additional words, or a phrase, if it appears additional information would be helpful. In cases for which the title contains little or no information related to the subject entry, it may be replaced entirely by the supplementary information. A qualifier is not always required, and in such cases the title will follow the unqualified subject descriptor.

The descriptors selected for use as subject terms are generally the names of specific materials, things, or processes. To the extent possible, a qualifier is selected to describe the properties of, or processses applied to, the subject term.

Index entries are selected to indicate the important ideas and concepts presented in a document, rather than words that may appear in the text. Within the available thesaurus terms, the most probable or logical place to look for typical information is selected. "See references" are included to guide users from synonymous terms or phrases to the descriptor selected as a subject heading for the concept. (e.g. Pipeline Quality Gas see HIGH BTU GAS). "See also references" are used to indicate where to find references to subject concepts that are narrower, broader, or related to a particular subject heading. To complete an exhaustive search of a given subject, all such headings should be reviewed.

A

A-BOMB SURVIVORS
Delayed Radiation Effects
Implications of new Hiroshima and Nagasaki dose estimates: cancer risks and neutron RBE, 7:32574
Radiation Doses
Implications of new Hiroshima and Nagasaki dose estimates: cancer risks and neutron RBE, 7:32574

ABSCESSES
Diagnosis
Detection of abscesses and lymphosarcoma with ^{111}In-deferoxamine mesylate, 7:32563

ABSORPTION REFRIGERATION CYCLE
Working Fluids
Thermodynamic characteristics of the ternary substance system methanol-lithium bromidee-zinc bromide, 7:32280

ACCELERATOR FACILITIES
See also TARGET CHAMBERS
Availability
User facilities at the Lawrence Berkeley Laboratory, 7:32354 (LBL-PUB—426)

ACCELERATORS
See also COLLECTIVE ACCELERATORS
ELECTROSTATIC ACCELERATORS
EREVAN SYNCHROTRON
FERMILAB ACCELERATOR
HEAVY ION ACCELERATORS
KEK SYNCHROTRON
LINEAR ACCELERATORS
NSLS
STORAGE RINGS
SYNCHROTRONS
UNILAC
Accelerators. Issue 17, 7:32314 (INIS-SU—67)

Data Acquisition Systems
Data acquisition tasks for TASSO. User manual, 7:32355 (RL—81-061)

ACES
See QUARKS

ACETATES
Chemical Reactions
Thermal ion-molecule reactions in oxygen-containing molecules, 7:32216 (JAERI-M—9336)

ACETONE
Solvent Properties
Macromolecular structural changes in bituminous coals during extraction and solubilization. Quarterly technical progress report, 1 September 1981-1 December 1981, 7:31724 (DOE/PC/30222—T2)

ACETYLENE
Lattice Field Theory
Polyacetylene: a real material linking condensed matter and field theory, 7:32754 (LA-UR—81-3636)
Statistical Mechanics
Polyacetylene: a real material linking condensed matter and field theory, 7:32754 (LA-UR—81-3636)

ACID ELECTROLYTE FUEL CELLS
Catalyst Supports
Survey of carbon and its role in phosphoric-acid fuel cells. Final report, 7:32108 (BNL—51418)
Electrocatalysts
Survey of carbon and its role in phosphoric-acid fuel cells. Final report, 7:32108 (BNL—51418)

ACID RAIN
Atmospheric Chemistry
Design and preliminary results of the intermediate density precipitation chemistry experiment, 7:32482
Environmental Effects
Effects of atmospheric deposition of energy-related pollutants on water quality: a review and assessment, 7:32478 (ANL/AA—26)

ACIDITY
See PH VALUE

ACOUSTIC EMISSION TESTING
Performance
Sound emission analyses used for material tests, 7:32294
Usefulness of energy measurements in industrial applications of acoustic emission, 7:32288
Sensitivity
Influence of detecting unit sensitivity upon the recording of acoustic emission signals, 7:32292

ACTH
Photometry
ACTH measurement in the hypophysis after adrenalectomy and adrenal cortex hormone therapy by means of microphotometry and radioimmunoassay method, 7:32551
Radioimmunoassay
ACTH measurement in the hypophysis after adrenalectomy and adrenal cortex hormone therapy by means of microphotometry and radioimmunoassay method, 7:32551

ACTINIDE NUCLEI
Isotope Production
Preparation of a variety of transuranium nuclides in Oak Ridge facilities, 7:32234 (IAEA-CN—40/74P)

ACTINIDES
Solubility
Solubility limits of importance to leaching, 7:32535

ACTIVATION ANALYSIS
Study on the neutron activation analysis, 7:32199 (KAERI/RR—272/80)

Comparative Evaluations
Comparative study of some methods for the determination of uranium used at the Instituto de Pesquisas Energeticas e Nucleares, 7:32193 (IPEN-Pub—17)

ACTIVATION DETECTORS
Performance
Interlaboratory niobium dosimetry comparison. The contribution of the GKSS-Forschungszentrum Geesthacht, 7:32374 (GKSS—80/E/36)

ADENOCARCINOMAS
See CARCINOMAS

ADRENOCORTICOTROPIC HORMONE
See ACTH

AERE
(Atomic Energy Research Establishment.)
Research Programs
Theoretical Physics Division progress report October 1979-September 1980, 7:32824 (AERE-PR/TP—37)

AEROSOLS
Atmospheric Chemistry
Environmental Chemistry Division annual report, 7:32479 (BNL—27818)
Nucleation and growth of stratospheric aerosols, 7:32489
Chemical State
Application of LAMMA in aerosol research, 7:32487
Environmental Effects
Reduction of photosynthetically active radiation under extreme stratospheric-aerosol loads, 7:32474 (LA-UR—81-3573)
Mass Spectroscopy
Application of LAMMA in aerosol research, 7:32487
Nucleation
Nucleation and growth of stratospheric aerosols, 7:32489

AFR STORAGE
See AWAY-FROM-REACTOR STORAGE

AFTER-HEAT REMOVAL
Radiative heat transfer to high pressure steam (BWR), 7:32044

AIR
See also EARTH ATMOSPHERE
SURFACE AIR
Geographical Variations
Effect of spatial variability of meteorological data on annual average air concentrations predicted by a wind-rose model (Savannah river plant), 7:32476

AIR POLLUTION
Environmental Transport
Modeling a multiple tracer release experiment during nocturnal drainage flow in complex terrain, 7:32491
Mass Spectroscopy
Contamination measurements with quadrupole mass spectrometer, 7:32485
Research Programs
Environmental Chemistry Division annual report, 7:32479 (BNL—27818)
Statistical Models
Application of factor analysis to urban aerosol source resolution, 7:32490

AIR POLLUTION MONITORS
Design
Electrochemical apparatus for simultaneously monitoring two gases, 7:32492

AIR QUALITY
Mathematical Models
Air-quality-model update, 7:32481 (UCID—19300)

ALABAMA
Ground Water
Ground-water levels in Alabama. For observation wells measured periodically, August 1952-July 1977. Circular 105, 7:32595 (NP—2902469)
Severance Tax
Severance taxes on coal and uranium in the sunbelt, 7:31745

ALAP
See RADIATION PROTECTION

ALCATOR DEVICE
ICR Heating
Comparative study of fundamental and second-harmonic ICRF wave propagation and damping at high density in the Alcator tokamak, 7:32848 (DOE/ET/51013—27)

ALCOHOL FUELS
Economic Analysis
Economics of ethanol in Indonesia, 7:31847 (NP—2902045)
Meetings
Workshop on ethanol as an alternative source of fuels, 7:31845 (NP—2902045)
Research Programs
Alcohol fuels program technical review, 7:31840 (DOE/TIC—2006904)

ALCOHOLS
See also ETHANOL
GLYCEROL
GLYCOLS
METHANOL
PROPANOLS
Chemical Reaction Yield
Carbon number distribution of Fischer-Tropsch products formed on an iron catalyst in a slurry reactor, 7:31826

ALDEHYDES
See also ARABINOSE
GLUCOSE
XYLOSE
Chemical Reaction Yield
Carbon number distribution of Fischer-Tropsch products formed on an iron catalyst in a slurry reactor, 7:31826
Chemical Reactions
Thermal ion-molecule reactions in oxygen-containing molecules, 7:32216 (JAERI-M—9336)

ALFVEN WAVES
Analytical Solution
New series of integrable nonlinear evolution equations, 7:32866 (IPPJ—484)

ALGINATES
Enzyme Inhibitors
Preparation and characterization of β-D-glucosidase immobilized in calcium alginate, 7:31848 (ORNL/MIT—336)

ALKALI METALS
See also CESIUM
POTASSIUM
SODIUM
Electronic Structure
ns-ms excitation of alkali atoms in the Glauber approximation, 7:32133 (CBPF-A—0017/80)
Rydberg Correction
Rydberg atoms, 7:32688 (AERE-R—9986)

ALKANES
See also CYCLOHEXANE
2-2-DIMETHYLPROPANE
ETHANE
METHANE
PROPANE
Chemical Reaction Kinetics
Reaction kinetics of cationic primary products in nonpolar solutions, 7:32225 (Zfl-Mitt—35)
Chemical Reaction Yield
Carbon number distribution of Fischer-Tropsch products formed on an iron catalyst in a slurry reactor, 7:31826
Radiolysis
Reaction kinetics of cationic primary products in nonpolar solutions, 7:32225 (Zfl-Mitt—35)

ALKENES
See also ETHYLENE
PROPYLENE
Chemical Radiation Effects
Primary processes of the radiation-induced cationic polymerization of aromatic olefins studied by pulse radiolysis (Electron beams), 7:32224 (Zfl-Mitt—35)
Chemical Reaction Kinetics
Reaction kinetics of cationic primary products in nonpolar solutions, 7:32225 (Zfl-Mitt—35)
Chemical Reaction Yield
Carbon number distribution of Fischer-Tropsch products formed on an iron catalyst in a slurry reactor, 7:31826
Radiolysis
Reaction kinetics of cationic primary products in nonpolar solutions, 7:32225 (Zfl-Mitt—35)

ALLOY-HT-9
Corrosion
Flow and fracture in the fusion environment, 7:32158 (PNL-SA—9759)
Fractures
Flow and fracture in the fusion environment, 7:32158 (PNL-SA—9759)
Materials Testing
Flow and fracture in the fusion environment, 7:32158 (PNL-SA—9759)
ALLOY-MM-0011
See IRON BASE ALLOYS
ALLOYS
Creep
Prediction of the behavior of structural materials under irradiation through modeling of the microstructure. Progress report, November 1, 1980-October 31, 1981. Final report, 7:32136 (DOE/ER/04861—3)
Microstructure
Prediction of the behavior of structural materials under irradiation through modeling of the microstructure. Progress report, November 1, 1980-October 31, 1981. Final report, 7:32136 (DOE/ER/04861—3)
Physical Radiation Effects
Prediction of the behavior of structural materials under irradiation through modeling of the microstructure. Progress report, November 1, 1980-October 31, 1981. Final report, 7:32136 (DOE/ER/04861—3)
Rates of defect production by fission neutrons in metals at 4.7 K, 7:32163
Radiation Effects
Proceedings of the 7. Bakurianian school on radiation physics of metals and alloys, 7:32152 (INIS-SU—61)
ALPHA SPECTROMETERS
Radiochemistry
Programmable α-spectrometer for radiochemical studies, 7:32417 (NIIAR—41(449))
Surface Barrier Detectors
Programmable α-spectrometer for radiochemical studies, 7:32417 (NIIAR—41(449))
ALPHA-BEARING WASTES
Information Systems
Solid Waste Information Management System (SWIMS). Data summary, Fiscal Year 1980, 7:31794 (DOE/TIC—2005250)
Inventories
Solid Waste Information Management System (SWIMS). Data summary, Fiscal Year 1980, 7:31794 (DOE/TIC—2005250)
ALTERNATE FUELS
See SYNTHETIC FUELS
ALUMINA
See ALUMINIUM OXIDES
ALUMINIUM
Charged-Particle Transport
Stopping power measurements with the modified UNILAC TOF-system, 7:32808 (GSI—81-2)
Leaching
Trace element characterization of coal wastes. Fifth annual progress report, October 1, 1979-September 30, 1980, 7:31728 (LA—8826-PR)
ALUMINIUM 27 TARGET
Hadron Reactions
Hadron-nucleon inelastic collision mean free path in nuclear matter, 7:32777 (JINR—E-1-80-799)
Hadron-nucleus collisions. Pt. 1. Picture, description procedure, cross-sections, 7:32778 (JINR—E-1-81-154)
Oxygen 16 Reactions
Contribution of quasi-elastic processes to the total reaction cross-section of heavy ions, 7:32769 (IFUSP-P—249)
Proton Reactions
Study on the neutron yield from thick targets under the action of 645 MeV protons, 7:32766 (JINR—18-80-540)
ALUMINIUM ALLOYS
See also ALUMINIUM BASE ALLOYS
Microstructure
Deuterium plasma-material wall interactions. Final report, 1 May 1979-30 September 1981, 7:32886 (DOE/ET/52008—2)
Solubility
Impurities diffusion in binary titanium-zirconium and titanium-aluminium alloys in a bcc solid-solution range, 7:32146 (FEI—1145)
ALUMINIUM ARSENIDES
Epitaxy
Liquid phase epitaxy techniques for compound semiconductor growth, 7:32185 (SAND—82-0025C)
ALUMINIUM BASE ALLOYS
Magnetic Susceptibility
Induced magnetism via conduction electron exchange; application to $PrAl_3$, 7:32134 (CBPF-A—0021/80)
ALUMINIUM OXIDES
Catalytic Effects
Integrated approach to the systematic synthesis, characterization, and catalytic activity of novel heterogeneous catalysts. Final progress report, 7:32206 (DOE/ER/10381—3)
Preparation of bimodal aluminas an molybdena/alumina extrudates, 7:31721
Chemical Preparation
Preparation of bimodal aluminas an molybdena/alumina extrudates, 7:31721
Gas Production Rates
Preliminary evaluation of beta-spodumene as a fusion reactor structural material, 7:32880 (CONF-810831—80)
Mechanical Properties
Preliminary evaluation of beta-spodumene as a fusion reactor structural material, 7:32880 (CONF-810831—80)
Microstructure
Preparation of bimodal aluminas an molybdena/alumina extrudates, 7:31721
Physical Radiation Effects
Preliminary evaluation of beta-spodumene as a fusion reactor structural material, 7:32880 (CONF-810831—80)
Porosity
Preparation of bimodal aluminas an molybdena/alumina extrudates, 7:31721
Sintering
Solid state formation of $Y_3Al_5O_{12}$, 7:32172 (IA—1364)
Sorptive Properties
Adsorption of technetium on selected inorganic ion-exchange materials and on a range of naturally occurring minerals under oxic conditions, 7:32244
Thermodynamic Properties
Preliminary evaluation of beta-spodumene as a fusion reactor structural material, 7:32880 (CONF-810831—80)
ALUMINIUM PHOSPHATES
Optical Properties
Optical properties of Nd^{3+} in metaphosphate glasses, 7:32187
AMERICIUM
Radionuclide Migration
Transfer of plutonium, americium, and curium from ground to vegetation through plant roots, 7:32512 (INIS-mf—6902)
Root Absorption
Transfer of plutonium, americium, and curium from ground to vegetation through plant roots, 7:32512 (INIS-mf—6902)
Sputtering
Target sputtering by multicharged heavy ion beams, 7:32711 (RI—120)
AMERICIUM 241
Biological Localization
In vivo measurement of actinides in the human lung, 7:32579
Gamma Spectroscopy
In situ subterranean determination of actinides by high-resolution gamma-ray spectrometry, 7:31817 (PNL-SA—8992)
AMERICIUM 243
Radiochemical Analysis
Determination of americium and plutonium in autopsy tissue: methods and problems, 7:32578
AMES TEST
See MUTAGEN SCREENING

AMINES
Fluorescence
Contribution of electronically excited states to the radiation chemistry of organic systems. Progress report, September 1, 1980-November 30, 1981, 7:32221 (DOE/ER/00913—2)
Photoionization
Contribution of electronically excited states to the radiation chemistry of organic systems. Progress report, September 1, 1980-November 30, 1981, 7:32221 (DOE/ER/00913—2)
AMINOGLYCIDES
See AMINES
SACCHARIDES
AMMONIA
Atom-Molecule Collisions
Time-resolved uv spectroscopy on ammonia excited by a pulsed CO_2 laser, 7:32710 (PLF—31)
Environmental Effects
Use of ammonia in energy-related applications, 7:31831 (PNL-SA—9057)
Excitation
Time-resolved uv spectroscopy on ammonia excited by a pulsed CO_2 laser, 7:32710 (PLF—31)
Ion-Molecule Collisions
Reactions of ions with atomic and molecular free radicals. Progress report, May 1, 1981-April 30, 1982 (Summaries of research activities at the University of Minnesota), 7:32693 (DOE/ER/02640—13)
Spectroscopy
Time-resolved uv spectroscopy on ammonia excited by a pulsed CO_2 laser, 7:32710 (PLF—31)
Uses
Use of ammonia in energy-related applications, 7:31831 (PNL-SA—9057)
AMMONIUM URANYL CARBONATES
See AUC
AMMUNITION
Performance
TAAMM submunition project. Monthly progress report No. 8, July 1-31, 1979, 7:32469 (UCID—18253)
AMPLIFIERS
See also OPERATIONAL AMPLIFIERS
Oscillations
Parasitic oscillations and their suppression in the Alvarez final radio-frequency amplifiers, 7:32330 (GSI—81-2)
ANALOG-TO-DIGITAL CONVERTERS
Design
Design and application of -55°C to +200°C hybrid data converters, 7:32456 (SAND—82-0425)
Performance Testing
Design and application of -55°C to +200°C hybrid data converters, 7:32456 (SAND—82-0425)
Temperature Effects
Design and application of -55°C to +200°C hybrid data converters, 7:32456 (SAND—82-0425)
ANESTHESIA
Physiology
Weak binding gases as modulators of hemoglobin function, 7:32567
ANGULAR VELOCITY
Spinning plasma ring stable to tilting mode, 7:32862 (IPPJ—478)
ANIMAL CELLS
See also TUMOR CELLS
Cytological Techniques
Differentiated state of normal and malignant cells or how to define a normal cell in culture, 7:32542
ANNULAR SPACE
Fluid Flow
Velocity and temperature profiles in rough annuli, 7:32273 (KFK—3163)
ANTIGENS
Spatial Distribution
Antibody coated gold particles containing radioactive gold in the demonstration of cell surface molecules, 7:32543
ANTINEOPLASTIC DRUGS
Radiosensitivity Effects
Nitroimidazoles of low toxicity and high activity as radiosensitizers of hypoxic tumor cells, 7:32584
ANTINEUTRINO-NUCLEON INTERACTIONS
Charged-Current Interactions
Recent results on total neutrino and antineutrino cross sections by the CFRR collaboration, 7:32724 (FERMILAB-Conf—81/80-Exp.)
Cross Sections
Recent results on total neutrino and antineutrino cross sections by the CFRR collaboration, 7:32724 (FERMILAB-Conf—81/80-Exp.)
Total Cross Sections
Recent results on total neutrino and antineutrino cross sections by the CFRR collaboration, 7:32730 (SLAC—245)
ANTIOXIDANTS
Synergism
Pathogenetic mechanism in lung fibrosis (Mice), 7:32585
ANTRIM SHALES
See BLACK SHALES
APPALACHIA
Black Shales
Twelfth annual Appalachian Petroleum Geology Symposium. Appalachian thrust belt/tight sands/shale gas. Circular No. C-20, 7:31749 (CONF-8103124—Absts)
Natural Gas Deposits
Twelfth annual Appalachian Petroleum Geology Symposium. Appalachian thrust belt/tight sands/shale gas. Circular No. C-20, 7:31749 (CONF-8103124—Absts)
Petroleum Deposits
Twelfth annual Appalachian Petroleum Geology Symposium. Appalachian thrust belt/tight sands/shale gas. Circular No. C-20, 7:31749 (CONF-8103124—Absts)
AQUATIC ECOSYSTEMS
Mathematical Models
Mathematical modelling - a management tool for aquatic ecosystems, 7:32525
Radionuclide Migration
Effects of atmospheric deposition of energy-related pollutants on water quality: a review and assessment, 7:32478 (ANL/AA—26)
AQUIFERS
Geochemistry
Solid phases limiting the concentration of dissolved constituents in basalt aquifers of the Columbia Plateau in eastern Washington, 7:32602 (PNL-SA—9848)
Sensible Heat Storage
Cost of heat from a seasonal source, 7:32067 (PNL-SA—9891)
ARABINOSE
Biosynthesis
Enzymatic hydrolysis of cellulose: theory and applications, 7:31829 (LBL—13669)
ARGON
Atom-Molecule Collisions
Time-resolved uv spectroscopy on ammonia excited by a pulsed CO_2 laser, 7:32710 (PLF—31)
Diffusion
Mound Facility activities in chemical and physical research: January-June 1981, 7:31825 (MLM—2884)
Electronic Structure
Electronic structure and Moessbauer isomer shift of the iron atom isolated in crystalline argon matrix, 7:32690 (CBPF-A—0004/80)
ARGON IONS
Collisions
Characterization of ion beam processed Si surface layer, 7:32718
Ion-Atom Collisions
Application of a position sensitive proportional counter for an X-ray transmission spectrometer, 7:32380 (GSI—81-2)
ARIZONA
Geothermal Resources
Geothermal Development Plan: Pima County, 7:31881 (DOE/RA/50076—T12)
Severance Tax
Severance taxes on coal and uranium in the sunbelt, 7:31745
ARKANSAS
Severance Tax
Severance taxes on coal and uranium in the sunbelt, 7:31745

AROMATICS
See also BIPHENYL
POLYCYCLIC AROMATIC HYDROCARBONS
STYRENE
TETRALIN
Chemical Reaction Kinetics
Reaction kinetics of cationic primary products in nonpolar solutions, 7:32225 (Zfl-Mitt—35)
Radiolysis
Reaction kinetics of cationic primary products in nonpolar solutions, 7:32225 (Zfl-Mitt—35)
ARSENIC
Biogeochemistry
Biogeochemistry of toxic metals, 7:32488
Leaching
Trace element characterization of coal wastes. Fifth annual progress report, October 1, 1979-September 30, 1980, 7:31728 (LA—8826-PR)
ASTATINE 201
Alpha Decay
Nuclear chemistry research and spectroscopy with radioactive sources. Seventeenth annual progress report, 7:32787 (DOE/ER/03346—T1)
Beta Decay
Nuclear chemistry research and spectroscopy with radioactive sources. Seventeenth annual progress report, 7:32787 (DOE/ER/03346—T1)
ATMOSPHERIC EXPOSURE CHAMBERS
See EXPOSURE CHAMBERS
ATOMIC BEAM SOURCES
Ion Collisions
ATOS-the installation for atom collision investigation, 7:32765 (IAE—3363/7)
ATOMIC BOMBS
See NUCLEAR WEAPONS
ATOMIC EXPLOSIONS
See NUCLEAR EXPLOSIONS
ATOMIC IONS
X-Ray Spectra
Statistical limits for the unfolding of closely overlapping peaks in the X-ray spectrum analysis, 7:32705 (JINR—E-7-12219)
ATOMIC WEAPONS
See NUCLEAR WEAPONS
ATOM-MOLECULE COLLISIONS
Sudden Approximation
Classical reactive infinite order sudden approximation. Theory, 7:32698 (IA—1364)
ATOMS
Rydberg Correction
Rydberg atoms, 7:32688 (AERE-R—9986)
AUC
Chemical Reaction Kinetics
Dynamics study of AUC precipitation. Studies on the reconversion of UF_6, 7:32236 (KAERI/RR—241/80)
Precipitation
Dynamics study of AUC precipitation. Studies on the reconversion of UF_6, 7:32236 (KAERI/RR—241/80)
AUSTENITIC STEELS
Corrosion
Flow and fracture in the fusion environment, 7:32158 (PNL-SA—9759)
High-temperature corrosion of ferritic chromium steels and austenitic chromium-nickel steels in atmospheres containing hydrogen sulphide, 7:32157 (NP—2901084)
Fractures
Flow and fracture in the fusion environment, 7:32158 (PNL-SA—9759)
Materials Testing
Flow and fracture in the fusion environment, 7:32158 (PNL-SA—9759)
AUTOMOBILES
See also TAXICABS
Energy Conservation
More kilometers with less gasoline, 7:32090 (NP—2901085)
Fuel Consumption
More kilometers with less gasoline, 7:32090 (NP—2901085)
Mechanical Transmissions
Small passenger car transmission test: Chevrolet Malibu 200C transmission with lockup, 7:32131 (DOE/NASA/0124—6)
AWAY-FROM-REACTOR STORAGE
Forecasting
Interim storage requirements for spent LWR fuel elements for alternative scenarios of an increased use of nuclear energy in the Federal Republic of Germany, 7:31791 (KFK—3084)

B

BACA GEOTHERMAL FIELD
Geologic Structures
Elastomechanical methods in the exploration of the Valles Caldera, New Mexico. Final report, June 8, 1981-October 8, 1981, 7:31882 (UCRL—15423)
Rheology
Elastomechanical methods in the exploration of the Valles Caldera, New Mexico. Final report, June 8, 1981-October 8, 1981, 7:31882 (UCRL—15423)
BACTERIA
See also HAEMOPHILUS
STREPTOMYCES
Control
Microbiological contamination of fuels during storage, 7:31763
Evaluation
Application of bacterial leaching technology to deep solution-mining conditions for uranium extraction. Final report, September 1, 1978-September 30, 1981, 7:31784 (NP—2902698)
BACTERICIDES
See GERMICIDES
BACTERIOPHAGES
Structural Chemical Analysis
T4 head assembly and high temperature, 7:32565
BAINITE
Crystal-Phase Transformations
FIM-atom probe investigation of the bainite transformation in CrMo steel, 7:32151 (INIS-mf—6830)
BAND THEORY
Many-Body Problem
Many-body effects on the x-ray spectra of metals, 7:32828 (DOE/ER/01198—1372)
BANKS
See COMMERCIAL BUILDINGS
BARIUM
Leaching
Trace element characterization of coal wastes. Fifth annual progress report, October 1, 1979-September 30, 1980, 7:31728 (LA—8826-PR)
BARIUM 125
Beta-Plus Decay
Nuclear chemistry research and spectroscopy with radioactive sources. Seventeenth annual progress report, 7:32787 (DOE/ER/03346—T1)
BARIUM 133
Adsorption
Radionuclide transport and retardation in tuff, 7:32523
Research and development related to the Nevada Nuclear Waste Storage Investigations. Progress report, April 1-June 30, 1981, 7:31795 (LA—8959-PR)
Environmental Transport
Radionuclide transport and retardation in tuff, 7:32523
BARIUM PHOSPHATES
Optical Properties
Optical properties of Nd^{3+} in metaphosphate glasses, 7:32187
BARRIERS
See DIFFUSION BARRIERS
BARSTOW SOLAR PILOT PLANT
Environmental Impacts
Environmental effects of solar thermal power systems: ecological observations during construction of the Barstow 10 MWe pilot STPS, 7:31863 (UCLA—12/1311)

BARYON NUMBER
Conservation Laws
Is the proton stable, 7:32736
BARYON RESONANCES
See also CHARMED BARYON RESONANCES
Rotational States
Interpretation of the N(1360) Gamma < 67 resonance, 7:32737
BARYONIUM
Color Model
Experimental meson spectroscopy, 7:32741 (KEK—79-33)
BASALT
Heating
Numerical prediction of basalt response for near-surface test facility heater tests No. 1 and No. 2, 7:31806 (RHO-BWI-C—86)
BASEDOW'S DISEASE
See HYPERTHYROIDISM
BATTERIES (ELECTRIC)
See ELECTRIC BATTERIES
BEAM BENDING MAGNETS
Magnetic Fields
Preparatory work for the SIS magnet measuring equipment, 7:32341 (GSI—81-2)
Power Supplies
Prototype thyristor-controlled power supply, 7:32332 (GSI—81-2)
BEAM MONITORING
Electric Charges
Fast measurement of charge state distributions behind the stripper, 7:32337 (GSI—81-2)
BEAM MONITORS
Beam Emittance
New emittance measuring device of the Unilac, 7:32336 (GSI—81-2)
BEAM OPTICS
Computer Codes
MIRKO - an interactive computer program for ion-optical systems, 7:32323 (GSI—81-2)
BEAM TRANSPORT
Beam Bending Magnets
Pulsed magnetic beam shifter for an emittance measurement equipment, 7:32350 (GSI—81-2)
BEHAVIOR
(Limited to living systems.)
Assessment of regional glucose metabolism in aging brain and dementia with positron-emission tomography, 7:32540 (BNL—30551)
BENZOQUINONES
Radiolysis
Rates, distances, and energy control of electron tunneling reactions in rigid media, 7:32227
BERYLLIUM
Deformation
Influence of the grain size on the characteristics of high-temperature plastic deformation of beryllium, 7:32155 (KFTI—81-15)
Grain Size
Influence of the grain size on the characteristics of high-temperature plastic deformation of beryllium, 7:32155 (KFTI—81-15)
Plasticity
Influence of the grain size on the characteristics of high-temperature plastic deformation of beryllium, 7:32155 (KFTI—81-15)
Self-Diffusion
Model of diffusion of metals. 2. Effect of polymorphic transformations on self-diffusion parameters, 7:32232 (FEI—1094)
BERYLLIUM 9 TARGET
Proton Reactions
Study on the neutron yield from thick targets under the action of 645 MeV protons, 7:32766 (JINR—18-80-540)
BERYLLIUM MODERATORS
See BERYLLIUM
BINARY-FLUID SYSTEMS
Working Fluids
Analyses of mixed hydrocarbon binary thermodynamic cycles for moderate temperature geothermal resources, 7:31893 (CONF-810812—42)
BIOCONVERSION
See also FERMENTATION
Biothermal conversion of biomass to methane and alcohols, 7:31836 (CONF-820217—4)
BIOLOGICAL MATERIALS
(See also specific biological materials.)
See also BIOMASS
FOOD
FOREST LITTER
MILK
PLANTS
TISSUES
Activation Analysis
Multi trace element analysis of dry biological materials by neutron activation analysis including a chemical group separation, 7:32192 (INIS-mf—6831)
BIOLOGICAL STRESS
Biological Indicators
Human birth weight patterns as an indicator of populations subject to environmental stress, 7:32570
BIOMASS
(All growing organic matter such as plants, trees, grasses, and algae.)
See also MANURES
PLANTS
WOOD
Anaerobic Digestion
Biothermal conversion of biomass to methane and alcohols, 7:31836 (CONF-820217—4)
Availability
Pacific Northwest biomass as an energy resource, 7:31850 (PNL-SA—9982)
Enzymatic Hydrolysis
Preparation and characterization of β-D-glucosidase immobilized in calcium alginate, 7:31848 (ORNL/MIT—336)
Fermentation
Biothermal conversion of biomass to methane and alcohols, 7:31836 (CONF-820217—4)
Gasification
Biothermal conversion of biomass to methane and alcohols, 7:31836 (CONF-820217—4)
Development of a pressurized biomass gasification process, 7:31835 (CONF-810865—10)
Treatment of biomass gasification wastewaters using wet air oxidation, solvent extraction, and reverse osmosis, 7:31849 (PNL-SA—9975)
Inventories
Pacific Northwest biomass as an energy resource, 7:31850 (PNL-SA—9982)
BIOMASS CONVERSION PLANTS
Design
Agricultural anaerobic digesters: design and operation, 7:31844 (NP—2901472)
Operation
Agricultural anaerobic digesters: design and operation, 7:31844 (NP—2901472)
Waste Processing
Treatment of biomass gasification wastewaters using wet air oxidation, solvent extraction, and reverse osmosis, 7:31849 (PNL-SA—9975)
BIOMASS PLANTATIONS
Propsects for ethanol in Indonesia, 7:31846 (NP—2902045)
Economics
Competitive capability of energy crops for arable land, 7:31837 (DFE—35)
Harvesting
Use of the biomass of black pine (Pinus nigra arn.) and locust (Robinia Pseudoacacia L.) as raw material for chip boards in consideration of whole-tree harvesting, 7:31842 (NP—2901104)

BIPHENYL
Radiolysis
Rates, distances, and energy control of electron tunneling reactions in rigid media, 7:32227
BIS(2-ETHYLHEXYL)PHOSPHORIC ACID
See HDEHP
BISMUTH
Foam Separation
Concentration of trace elements from Cheleken peninsula thermal brines by means of foam flotation, 7:32195 (JINR—6-81-75)
BISMUTH 201
Energy Levels
Nuclear chemistry research and spectroscopy with radioactive sources. Seventeenth annual progress report, 7:32787 (DOE/ER/03346—T1)
BISMUTH 207
Electron Capture Decay
Nuclear chemistry research and spectroscopy with radioactive sources. Seventeenth annual progress report, 7:32787 (DOE/ER/03346—T1)
BISMUTH 209 TARGET
Calcium 48 Reactions
Study on the ^{48}Ca ion fusion with sup(203,205)Tl, sup(208)Pb and sup(209)Bi nuclei, 7:32790 (JINR-R—7-12061)
BITUMINOUS COAL
Calorific Value
Predictors of plasticity in bituminous coals. Technical progress report No. 1, 7:31726 (DOE/PC/40793—T1)
Chemical Composition
Predictors of plasticity in bituminous coals. Technical progress report No. 1, 7:31726 (DOE/PC/40793—T1)
Dissolution
Radical pathways of coal dissolution in donor media during reactions of coals and specifically deuterated tetralin, 7:31719 (PNL-SA—9020)
Extraction
Macromolecular structural changes in bituminous coals during extraction and solubilization. Quarterly technical progress report, 1 September 1981-1 December 1981, 7:31724 (DOE/PC/30222—T2)
Microstructure
Macromolecular structural changes in bituminous coals during extraction and solubilization. Quarterly technical progress report, 1 September 1981-1 December 1981, 7:31724 (DOE/PC/30222—T2)
Molecular Weight
Macromolecular structural changes in bituminous coals during extraction and solubilization. Quarterly technical progress report, 1 September 1981-1 December 1981, 7:31724 (DOE/PC/30222—T2)
Plasticity
Predictors of plasticity in bituminous coals. Technical progress report No. 1, 7:31726 (DOE/PC/40793—T1)
Porosity
Macromolecular structural changes in bituminous coals during extraction and solubilization. Quarterly technical progress report, 1 September 1981-1 December 1981, 7:31724 (DOE/PC/30222—T2)
Pyrolysis
Predictors of plasticity in bituminous coals. Technical progress report No. 1, 7:31726 (DOE/PC/40793—T1)
BLACK COAL
Energy Demand
Black coal. Data and trends 1978/79, 7:31735 (NP—2901005)
BLACK SHALES
Chemical Composition
Conversion of kerogen of Eastern US oil shale by tetralin and hydrogen, 7:31773 (CONF-820217—5)
Explosive Fracturing
Fracture of Devonian shale by tailored pulse-loading. Final report, August 15, 1977-August 15, 1978, 7:31769 (DOE/ET/12074—T1)
Fracture of Devonian shale by tailored pulse-loading. Quarterly progress report 2, January 1-March 31, 1978, 7:31770 (DOE/ET/12074—T3)
Hytort Process
Conversion of kerogen of Eastern US oil shale by tetralin and hydrogen, 7:31773 (CONF-820217—5)
Petrography
Conversion of kerogen of Eastern US oil shale by tetralin and hydrogen, 7:31773 (CONF-820217—5)
BLOWDOWN
Two-Dimensional Calculations
Analysis of pressure oscillations and pressure spikes in the Marviken pressure suppression containment, 7:32025 (GKSS—81/E/27)
BOILER FUELS
Fuel Substitution
Potential for use of peat blends with coal for electric power generation, 7:31743
BOILERS
Operation
Economics and operating characteristics of various materials-handling systems and wood fuels in small- to medium-sized boilers. Final report, 7:32122 (DOE/ET/20618—T1)
BOILING WATER REACTORS
See BWR TYPE REACTORS
BOLTZMANN COLLISION INTEGRAL
See BOLTZMANN EQUATION
BOLTZMANN EQUATION
Analytical Solution
Interface hydrodynamic plasmon solutions of the Boltzmann equation, 7:32829 (DOE/ER/10890—1)
Plasmons
Interface hydrodynamic plasmon solutions of the Boltzmann equation, 7:32829 (DOE/ER/10890—1)
BOLTZMANN TRANSPORT EQUATION
See BOLTZMANN EQUATION
BONES
See SKELETON
BONNEVILLE POWER ADMINISTRATION
Energy Conservation
Energy conservation management conference, 7:32089 (CONF-810370—)
BORATES
See also BORAX
Density
Measurements of density and of thermal expansion coefficient of sodium tetraborate (borax)-UO_2 and of sodium metaborate-UO_2 solutions, 7:32174 (KFK—3088)
Thermal Expansion
Measurements of density and of thermal expansion coefficient of sodium tetraborate (borax)-UO_2 and of sodium metaborate-UO_2 solutions, 7:32174 (KFK—3088)
BORAX
Density
Measurements of density and of thermal expansion coefficient of sodium tetraborate (borax)-UO_2 and of sodium metaborate-UO_2 solutions, 7:32174 (KFK—3088)
Thermal Expansion
Measurements of density and of thermal expansion coefficient of sodium tetraborate (borax)-UO_2 and of sodium metaborate-UO_2 solutions, 7:32174 (KFK—3088)
BORN-GREEN-YVON EQUATION
See BOLTZMANN EQUATION
BORON 10
Nuclear Reaction Analysis
Study on lethal effect on cells by determination of ^{10}B in biological tissues and (n, α) reaction. Quantitative determination of ^{10}B in biological tissues by soiled state track detection, 7:32571 (KURRI-TR—195)
BRAIN
Dynamic Function Studies
Assessment of regional glucose metabolism in aging brain and dementia with positron-emission tomography, 7:32540 (BNL—30551)
BRAKING RADIATION
See BREMSSTRAHLUNG

BRAZIL
Natural Radioactivity
Two decades of research in the Brazilian areas of high natural radioactivity, 7:32521 (PUC-tn—02/80)
BREMSSTRAHLUNG
Angular Distribution
Angular distribution of bremsstrahlung γ-quanta, 7:32805 (EFI—421(28)-80)
BREMSSTRAHLUNG (MAGNETIC)
See SYNCHROTRON RADIATION
BRINES
Chemical Analysis
Concentration of trace elements from Cheleken peninsula thermal brines by means of foam flotation, 7:32195 (JINR—6-81-75)
BROMINE ISOTOPES
Isotope Separation
Mound Facility activities in chemical and physical research: January-June 1981, 7:31825 (MLM—2884)
BROMOURACILS
Photolysis
Measurement of gap filling by bromouracil photolysis, 7:32582
Measurement of repair synthesis by photolysis of bromouracil, 7:32583
BSF REACTOR
See BSR-1 REACTOR
BSR-1 REACTOR
Reactor Operation
Bulk Shielding Facility. Quarterly report, October-December 1980, 7:32005 (ORNL/TM—7978)
Bulk Shielding Facility quarterly report, April, May, and June 1981, 7:32007 (ORNL/TM—8029)
Bulk shielding facility quarterly report, July, August, and September 1980, 7:32004 (ORNL/TM—7841)
BSR-2 REACTOR
Reactor Operation
Bulk Shielding Facility. Quarterly report, October-December 1980, 7:32005 (ORNL/TM—7978)
Bulk Shielding Facility quarterly report, April, May, and June 1981, 7:32007 (ORNL/TM—8029)
Bulk shielding facility quarterly report, July, August, and September 1980, 7:32004 (ORNL/TM—7841)
BUBBLES
Particle Size
Measurement of bubble size distributions in fermentation media using a photoelectric probe, 7:32464
BUILDING MATERIALS
See also CONCRETES
Thermal Diffusivity
Ordinance on energy-saving thermal insulation of buildings. Thermal Insulation Ordinance (Waermeschutz V). Dated from August 11, 1977, 7:32115 (NP—2901002)
BUILDINGS
See also COMMERCIAL BUILDINGS
RESIDENTIAL BUILDINGS
Cooling Load
Influence of buildings geometrical and physical parameters on thermal cooling load, 7:32111 (INIS-mf—6766)
Energy Conservation
Ordinance on energy-saving thermal insulation of buildings. Thermal Insulation Ordinance (Waermeschutz V). Dated from August 11, 1977, 7:32115 (NP—2901002)
Floors
Report of investigation, first floor slab in ORNL building 9204-1, Y-12 plant, 7:32256 (Y/EN—611)
Space HVAC Systems
White paper for rational energy use. Exemplary air conditioning, ventilation, and heating systems, 7:32114 (NP—2900953)
BUILDINGS (CONTAINMENT)
See CONTAINMENT BUILDINGS
BULK SHIELDING REACTOR-1
See BSR-1 REACTOR
BULK SHIELDING REACTOR-2
See BSR-2 REACTOR
BURST CAN DETECTION
See FAILED ELEMENT DETECTION
BURST SLUG DETECTION
See FAILED ELEMENT DETECTION
BWR TYPE REACTORS
See also HDR REACTOR
VK-50 REACTOR
Blowdown
Analysis of pressure oscillations and pressure spikes in the Marviken pressure suppression containment, 7:32025 (GKSS—81/E/27)
Containment Buildings
Full-Scale Mark II CRT program data report No. 10 (TEST 1203), 7:32030 (JAERI-M—9403)
Full-Scale Mark II CRT program data report No. 11 (TEST 1204), 7:32031 (JAERI-M—9404)
Containment Systems
Analysis of pressure oscillations and pressure spikes in the Marviken pressure suppression containment, 7:32025 (GKSS—81/E/27)
Analysis of fluid-structure interaction in pressure suppression systems type 69 during steam condensation, 7:32026 (GKSS—81/E/27)
Mark III Confirmation Test Program, 7:32021 (GKSS—81/E/27)
Modal analysis of the GKSS-PSS-wet well, 7:32028 (GKSS—81/E/27)
Multi-vent system problems, 7:32023 (GKSS—81/E/27)
Multi-vent effects on the dynamic pressure caused by chugging, 7:32024 (GKSS—81/E/27)
Recent research at MIT on fluid-structure interactions, chugging, and scaling laws for SRV discharges, 7:32027 (GKSS—81/E/27)
Review of GKSS 3-vent experimental program and results, 7:32022 (GKSS—81/E/27)
State of JAERI Full-Scale Mark II CRT Program, 7:32020 (GKSS—81/E/27)
State of pressure suppression containment research in the Federal Republic of Germany, 7:32019 (GKSS—81/E/27)
ECCS
Experimental study of safety injection and reflooding, 7:32032 (KAERI/RR—231/80)
Fuel Cycle
Assessment of nonbackfittable concepts for improving uranium utilization in LWRs, 7:31918 (PNL-SA—9100)
Boiling water reactor uranium utilization improvement potential, 7:31917 (ORNL/SUB—7537/15)
Fuel Elements
Best estimate radiation heat transfer model developed for TRAN-BD1, 7:32043
Radiative heat transfer to high pressure steam, 7:32044
Heat Transfer
Interactive fluid-structural dynamic problems in power engineering, presented at the joint conference of the pressure vessels and piping, materials, nuclear engineering, solar energy divisions, 1981, 7:32052
Hydrodynamics
Interactive fluid-structural dynamic problems in power engineering, presented at the joint conference of the pressure vessels and piping, materials, nuclear engineering, solar energy divisions, 1981, 7:32052
Loss of Coolant
Experimental study of safety injection and reflooding, 7:32032 (KAERI/RR—231/80)
Full-Scale Mark II CRT program data report No. 10 (TEST 1203), 7:32030 (JAERI-M—9403)
Full-Scale Mark II CRT program data report No. 11 (TEST 1204), 7:32031 (JAERI-M—9404)
Holographic investigation of nonequilibrium vapor generation in a two-dimensional nozzle, 7:32016 (EGG-M—02381)
Radiative heat transfer to high pressure steam, 7:32044
Transient deformation properties of Zircaloy for LOCA simulation. Final report, 7:32017 (EPRI-NP—526-Vol.4,Pt.2)
Meetings
Interactive fluid-structural dynamic problems in power engineering, presented at the joint conference of the pressure vessels and piping, materials, nuclear engineering, solar energy divisions, 1981, 7:32052

Pipes
Qualification of induction heating stress improvement for mitigation of stress corrosion cracking, 7:32047
Pressure Release
Recent research at MIT on fluid-structure interactions, chugging, and scaling laws for SRV discharges, 7:32027 (GKSS—81/E/27)
Pressure Suppression
Analysis of pressure oscillations and pressure spikes in the Marviken pressure suppression containment, 7:32025 (GKSS—81/E/27)
Analysis of fluid-structure interaction in pressure suppression systems type 69 during steam condensation, 7:32026 (GKSS—81/E/27)
Mark III Confirmation Test Program, 7:32021 (GKSS—81/E/27)
Modal analysis of the GKSS-PSS-wet well, 7:32028 (GKSS—81/E/27)
Multi-vent system problems, 7:32023 (GKSS—81/E/27)
Multi-vent effects on the dynamic pressure caused by chugging, 7:32024 (GKSS—81/E/27)
Recent research at MIT on fluid-structure interactions, chugging, and scaling laws for SRV discharges, 7:32027 (GKSS—81/E/27)
Review of GKSS 3-vent experimental program and results, 7:32022 (GKSS—81/E/27)
State of JAERI Full-Scale Mark II CRT Program, 7:32020 (GKSS—81/E/27)
State of pressure suppression containment research in the Federal Republic of Germany, 7:32019 (GKSS—81/E/27)
Pressure Vessels
Curve fitting and uncertainty analysis of Charpy impact data, 7:31916 (NUREG/CR—2408)
Primary Coolant Circuits
Holographic investigation of nonequilibrium vapor generation in a two-dimensional nozzle, 7:32016 (EGG-M—02381)
Reactor Components
Flow induced vibration in the design of nuclear components, 7:31919
Reactor Cores
Assessment of nonbackfittable concepts for improving uranium utilization in LWRs, 7:31918 (PNL-SA—9100)
Reactor Materials
Transient deformation properties of Zircaloy for LOCA simulation. Final report, 7:32017 (EPRI-NP—526-Vol.4,Pt.2)
Reactor Operation
Boiling water reactor uranium utilization improvement potential, 7:31917 (ORNL/SUB—7537/15)
Reactor Safety
Radiative heat transfer to high pressure steam, 7:32044
Shock Absorbers
Lateral loadings on snubber assemblies, 7:32058

C

CADMIUM
Diffusion
Cd diffusion into PbTe, 7:32211 (IA—1364)
Ecological Concentration
Exposure to heavy metals from foods, 7:32500
Situation and analysis of residues in milk, 7:32499
Leaching
Trace element characterization of coal wastes. Fifth annual progress report, October 1, 1979-September 30, 1980, 7:31728 (LA—8826-PR)
CADMIUM PHOSPHATES
Optical Properties
Optical properties of Nd^{3+} in metaphosphate glasses, 7:32187
CADMIUM SULFIDE SOLAR CELLS
Electric Contacts
Development of copper sulfide/cadmium sulfide thin-film solar cells, 7:31851 (SERI/PR—8143-1-T5)
Fabrication
Development of copper sulfide/cadmium sulfide thin-film solar cells, 7:31851 (SERI/PR—8143-1-T5)
Performance
Development of copper sulfide/cadmium sulfide thin-film solar cells, 7:31851 (SERI/PR—8143-1-T5)
CALCINED WASTES
Leaching
High-level waste immobilization program. Quarterly report, October-December 1979, 7:31800 (PNL-SA—8408)
CALCIUM
Leaching
Trace element characterization of coal wastes. Fifth annual progress report, October 1, 1979-September 30, 1980, 7:31728 (LA—8826-PR)
CALCIUM 48 REACTIONS
Fusion Reactions
Experiments on the fusion of element 108 in the $^{226}Ra + ^{48}Ca$ reaction, 7:32792 (JINR-R—7-12054)
Study on the ^{48}Ca ion fusion with sup(203,205)Tl, sup(208)Pb and sup(209)Bi nuclei, 7:32790 (JINR-R—7-12061)
CALCIUM COMPOUNDS
Enzyme Inhibitors
Preparation and characterization of β-D-glucosidase immobilized in calcium alginate, 7:31848 (ORNL/MIT—336)
CALCIUM FLUORIDES
Thermoluminescence
TL-studies of ion-implanted CaF_2, 7:32181 (GSI—81-2)
CALCIUM ISOTOPES
Isotope Separation
Mound Facility activities in chemical and physical research: January-June 1981, 7:31825 (MLM—2884)
CALCIUM PHOSPHATES
Optical Properties
Optical properties of Nd^{3+} in metaphosphate glasses, 7:32187
CALIFORNIA
See also LOS ANGELES
Severance Tax
Severance taxes on coal and uranium in the sunbelt, 7:31745
CALIFORNIUM
Ion Exchange Chromatography
Possibility of chromatographic separation of curium and californium on phosphorus- and phosphorus-nitrogen-containing ionites, 7:32191 (IAE—3303/13)
CALIFORNIUM 249
Electrochemistry
Electrochemical studies of trivalent californium and selected trivalent lanthanides in aqueous solutions, 7:32242
CALORIMETERS (PARTICLE)
See SHOWER COUNTERS
CAMAC SYSTEM
(Computer Application to Measurement And Control.)
Data Acquisition Systems
Multi-channel amplitude analyzer on the basis of the MERA-60 microcomputer, 7:32451 (JINR—13-81-11)
Display Devices
Units for output of graphical information on display in the "Crystal" experiment, 7:32450 (JINR—1-81-29)
Equipment Interfaces
Units of reprogramming memory devices in the Camac-Vector systems, 7:32449 (ITEF—112(1980))
Microelectronic Circuits
Units of reprogramming memory devices in the Camac-Vector systems, 7:32449 (ITEF—112(1980))
Microprocessors
Multi-channel amplitude analyzer on the basis of the MERA-60 microcomputer, 7:32451 (JINR—13-81-11)
Units for output of graphical information on display in the "Crystal" experiment, 7:32450 (JINR—1-81-29)
CANADA
Natural Gas Industry
1980 Legal Report of Oil and Gas Conservation Activities, 7:31754 (NP—2901180)
Petroleum Industry
1980 Legal Report of Oil and Gas Conservation Activities, 7:31754 (NP—2901180)

CANDU TYPE REACTORS
See also WOLSUNG-1 REACTOR
Fuel Element Clusters
Fabrication of PWR fuel assembly and CANDU fuel bundle, 7:31926 (KAERI/RR—243/80)
Manufacturing of laboratory equipments, 7:31940 (KAERI/RR—238/80)
CANONICAL EQUATIONS
See DIFFERENTIAL EQUATIONS
CARBON
See also DIAMONDS
GRAPHITE
Chemical Properties
Survey of carbon and its role in phosphoric-acid fuel cells. Final report, 7:32108 (BNL—51418)
Diffusion
Investigation into carbon diffusion in multicomponent iron alloys with chromium, nickel, molybdenum and niobium in the range of γ-solid solutions, 7:32145 (FEI—1113)
Foils
Equipment for producing, investigating and testing carbon foils with high hydrogen contents, 7:32180 (GSI—81-2)
Hydrogenation
Hydrogenolysis of carbon and its catalysis by platinum, 7:31722
Ion-Atom Collisions
Reactions of ions with atomic and molecular free radicals. Progress report, May 1, 1981-April 30, 1982 (Summaries of research activities at the University of Minnesota), 7:32693 (DOE/ER/02640—13)
Physical Properties
Survey of carbon and its role in phosphoric-acid fuel cells. Final report, 7:32108 (BNL—51418)
Production
Survey of carbon and its role in phosphoric-acid fuel cells. Final report, 7:32108 (BNL—51418)
Proton Reactions
Study on the neutron yield from thick targets under the action of 645 MeV protons, 7:32766 (JINR—18-80-540)
CARBON 12 TARGET
Hadron Reactions
Hadron-nucleon inelastic collision mean free path in nuclear matter, 7:32777 (JINR—E-1-80-799)
Oxygen 16 Reactions
Low angular-momentum-cutoff in statistical heavy-ion processes, 7:32768 (IFUSP-P—244)
CARBON 14
Radioecological Concentration
Status report - transfer of C-14 from air to humans, 7:32507 (INIS-mf—6902)
Radionuclide Migration
Transfer from vegetation to milk, 7:32518 (INIS-mf—6902)
CARBON DIOXIDE
Environmental Impacts
Global CO_2 buildup and possible climate modification, 7:32480 (PNL-SA—9311)
CARBON DIOXIDE LASERS
Performance
Repetitively pulsed sealed-TE CO_2 laser using an oxygen tolerant discharge scheme, 7:32266
CARBON MONOXIDE
Combustion
Coupling of transport and chemical processes in catalytic combustion. Final report, 7:32305 (DOE/MC/14036—T1)
Environmental Impacts
Global CO_2 buildup and possible climate modification, 7:32480 (PNL-SA—9311)
Methanation
Carbon number distribution of Fischer-Tropsch products formed on an iron catalyst in a slurry reactor, 7:31826
Hydrogenation of carbon monoxide over rhodium oxide surfaces (At 250 to 350°C and 6 atm), 7:31827
Integrated approach to the systematic synthesis, characterization, and catalytic activity of novel heterogeneous catalysts. Final progress report, 7:32206 (DOE/ER/10381—3)
Studies of carbon monoxide hydrogenation over ruthenium using transient response techniques, 7:32217
Reduction
Reduction of carbon monoxide. Past research summary, 7:32215 (DOE/ER/04949—1)
CARBON SULFIDES
Ion-Molecule Collisions
Reactions of ions with atomic and molecular free radicals. Progress report, May 1, 1981-April 30, 1982 (Summaries of research activities at the University of Minnesota), 7:32693 (DOE/ER/02640—13)
CARCINOGENS
Biological Indicators
Sperm assays in man and other mammals as indicators of chemically induced testicular dysfunction, 7:32588
CARCINOMAS
Diagnosis
Carcinoma in hyperfunctioning thyroid nodule in recurrent hyperthyroidism, 7:32559
CASCADE SHOWERS
Calculation of electron-photon cascades in the energy range of 10^{15}-10^{19} eV taking into account the LPM effect, 7:32750
CATALYSTS
Surface Properties
Catalytic behavior of a cation in a solid solution: an electrostatic potential approach, 7:32220
Synthesis
Clustering of metal atoms in organic media. 9. High-activity Ni/MgO catalysts prepared by metal vapor methods. Surface area and particle size effects, 7:32205
Integrated approach to the systematic synthesis, characterization, and catalytic activity of novel heterogeneous catalysts. Final progress report, 7:32206 (DOE/ER/10381—3)
CATALYTIC COMBUSTORS
Computerized Simulation
Coupling of transport and chemical processes in catalytic combustion. Final report, 7:32305 (DOE/MC/14036—T1)
Exhaust Gases
Coupling of transport and chemical processes in catalytic combustion. Final report, 7:32305 (DOE/MC/14036—T1)
Performance
Coupling of transport and chemical processes in catalytic combustion. Final report, 7:32305 (DOE/MC/14036—T1)
CATHODE RAY TUBE DIGITIZERS
Control algorithms for scanning device AELT-2/160. Pt. 1, 7:32452 (JINR-R—10-81-83)
CATHODE SPUTTERING
Physical problems of cathode sputtering. Reviews, 7:32890 (INIS-SU—33)
CATHODIC PROTECTION
Defects
Fault detection and potential measurements with buried pipes, 7:32259
CAVITY RESONATORS
Permanent Magnets
Measurements on the ferrite rings for the SIS prototype-cavity, 7:32333 (GSI—81-2)
Tuning
New capacitive tuners for the single-gap-cavities, 7:32331 (GSI—81-2)
CELLS (ANIMAL)
See ANIMAL CELLS
CELLS (BACTERIAL)
See BACTERIA
CELLS (REACTOR)
See REACTOR CELLS
CELLULOSE
Decomposition
Literature survey of intermediate products formed during the thermal aqueous degradation of cellulose, 7:31854
Enzymatic Hydrolysis
Enzymatic hydrolysis of cellulose: theory and applications, 7:31829 (LBL—13669)
CEMENT INDUSTRY
Air Pollution
Emissions and immissions of environmentally relevant trace elements, 7:32486

CENTRAL RECEIVERS
Market
Solar central receivers: the technology, industry, markets, and economics, 7:31862 (DOE/SF/11436—1-Exect.Summ.)
Technology Assessment
Solar central receivers: the technology, industry, markets, and economics, 7:31862 (DOE/SF/11436—1-Exect.Summ.)
CERAMICS
Gas Production Rates
Preliminary evaluation of beta-spodumene as a fusion reactor structural material, 7:32880 (CONF-810831—80)
Mechanical Properties
Preliminary evaluation of beta-spodumene as a fusion reactor structural material, 7:32880 (CONF-810831—80)
Physical Radiation Effects
Preliminary evaluation of beta-spodumene as a fusion reactor structural material, 7:32880 (CONF-810831—80)
Thermodynamic Properties
Preliminary evaluation of beta-spodumene as a fusion reactor structural material, 7:32880 (CONF-810831—80)
CEREALS
Microradiography
Radiographic techniques for investigating cereal grains, 7:32566
CERIUM
Self-Diffusion
Model of diffusion of metals. 2. Effect of polymorphic transformations on self-diffusion parameters, 7:32232 (FEI—1094)
CERIUM-ALPHA
Phase Transformations
α-γ transition of cerium metal, 7:32164
CERIUM-GAMMA
Phase Transformations
α-γ transition of cerium metal, 7:32164
CESIUM
Complexometry
Effect of organic complexants on the mobility of low level waste radionuclides in soils, 7:31805 (PNL-SA—10019)
Ion Collisions
Model for H^-, D^- production by hydrogen backscattering form alkali and alkali/transition-metal surfaces (Marlowe Code), 7:32907
Photon-Atom Collisions
Photoionization of atoms. Final report, April 1, 1976-March 30, 1981, 7:32695 (DOE/ER/02892—30)
Solvent Extraction
Crown ethers as size-selective synergists in solvent extraction systems: a new selectivity parameter, 7:32218
Sorption
Effect of organic complexants on the mobility of low level waste radionuclides in soils, 7:31805 (PNL-SA—10019)
CESIUM 137
Adsorption
Radionuclide transport and retardation in tuff, 7:32523
Research and development related to the Nevada Nuclear Waste Storage Investigations. Progress report, April 1-June 30, 1981, 7:31795 (LA—8959-PR)
Environmental Transport
Radionuclide transport and retardation in tuff, 7:32523
Radionuclide Migration
Transfer from vegetation to meat, 7:32519 (INIS-mf—6902)
Root Absorption
Transfer of Sr and Cs into vegetation through the roots, 7:32508 (INIS-mf—6902)
CESIUM COMPOUNDS
Crystal Structure
^2D and ^{133}Cs NMR study of the hydrogen bond network and antiferroelectric phase transition of cesium trihydrogen selenite, 7:32214
Phase Transformations
^2D and ^{133}Cs NMR study of the hydrogen bond network and antiferroelectric phase transition of cesium trihydrogen selenite, 7:32214
CESIUM ISOTOPES
Radionuclide Migration
Transfer from vegetation to milk, 7:32518 (INIS-mf—6902)
CESR STORAGE RING
Radiation Detectors
Recent results from CLEO, 7:32364 (SLAC—245)
CHARGED-PARTICLE ACTIVATION
See ACTIVATION ANALYSIS
CHARGING MACHINES (REACTOR)
See REACTOR CHARGING MACHINES
CHARM PARTICLES
See also CHARMED BARYON RESONANCES
CHARMED MESON RESONANCES
Particle Decay
Photoproduction of charmed particles at 19.5 GeV, 7:32747 (SLAC—245)
Photoproduction
Photoproduction of charmed particles at 19.5 GeV, 7:32747 (SLAC—245)
CHARMED BARYON RESONANCES
Particle Decay
Charm particle production in hadronic interactions: recent results from CERN at SPS energies, 7:32728 (SLAC—245)
Particle Production
Charm particle production in hadronic interactions: recent results from CERN at SPS energies, 7:32728 (SLAC—245)
CHARMED MESON RESONANCES
Particle Decay
Charm particle production in hadronic interactions: recent results from CERN at SPS energies, 7:32728 (SLAC—245)
Particle Production
Charm particle production in hadronic interactions: recent results from CERN at SPS energies, 7:32728 (SLAC—245)
CHARPY TEST
Curve fitting and uncertainty analysis of Charpy impact data, 7:31916 (NUREG/CR—2408)
CHEMICAL DOSEMETERS
Accuracy
Investigation of the radiochromic dye film dosimeter under process conditions, including stability, precision, accuracy, the influence of dose rate, and the influence of the environment. Part of a coordinated programme on high-dose standardization and intercomparison for industrial radiation processing. Final report for the period 1 August 1977 - 31 July 1981, 7:32390 (IAEA-R—2051-F)
Performance Testing
Investigation of the radiochromic dye film dosimeter under process conditions, including stability, precision, accuracy, the influence of dose rate, and the influence of the environment. Part of a coordinated programme on high-dose standardization and intercomparison for industrial radiation processing. Final report for the period 1 August 1977 - 31 July 1981, 7:32390 (IAEA-R—2051-F)
CHEMICAL PLANTS
Radioactive Effluents
Natural radioactivity in the production of titanium dioxide pigment: a study of the Laporte Plant and environment behaviour of radionuclides at Bunbury, Western Australia, 7:32504 (ARL/TR—037)
CHEMICAL REACTORS
Design
Alcohol fuels program technical review, 7:31840 (DOE/TIC—2006904)
Design of fluidized-bed, biological denitrification systems, 7:32527 (ORNL/TM—7628)
Ebullated Bed
Investigation of power consumption, suspension and flooding characteristics of stirred, aerated slurry reactors, 7:32124
Energy Consumption
Investigation of power consumption, suspension and flooding characteristics of stirred, aerated slurry reactors, 7:32124
Flowsheets
Design of fluidized-bed, biological denitrification systems, 7:32527 (ORNL/TM—7628)
Stirring
Investigation of power consumption, suspension and flooding characteristics of stirred, aerated slurry reactors, 7:32124
CHEMISTRY
See also RADIATION CHEMISTRY

Meetings
1. Regional meeting on chemistry. Book of abstracts, 7:32188 (INIS-mf—6737)

CHEMOTHERAPY
Side Effects
'Sickle-sign' in bone scintigraphy, 7:32554

CHERENKOV COUNTERS
Fluorescent light detector in Dumand, 7:32428
Efficiency
Wide-aperture gas threshold Cherenkov counter, 7:32407 (JINR-R—1-81-30)
Energy Resolution
High resolution Cherenkov counter with liquid radiator, 7:32394 (IFVE-OEF—81-63)
Pion Detection
Wide-aperture gas threshold Cherenkov counter, 7:32407 (JINR-R—1-81-30)

CHESAPEAKE BAY
Radionuclide Migration
Reactor-released radionuclides in Susquehanna River sediments, 7:32522
Sediments
Reactor-released radionuclides in Susquehanna River sediments, 7:32522

CHI RESONANCES
Particle Production
Pion production of chi mesons, 7:32746 (SLAC—245)

CHINONE
See BENZOQUINONES

CHLORIDES
Measuring Instruments
Apparatus for measuring chloride emissions from refuse incineration, 7:32465
Measuring Methods
Apparatus for measuring chloride emissions from refuse incineration, 7:32465
Solvent Properties
Crown ethers as size-selective synergists in solvent extraction systems: a new selectivity parameter, 7:32218

CHLORINATED ALIPHATIC HYDROCARBONS
Chemical Reaction Kinetics
Reaction kinetics of cationic primary products in nonpolar solutions, 7:32225 (Zfl-Mitt—35)
Radiolysis
Reaction kinetics of cationic primary products in nonpolar solutions, 7:32225 (Zfl-Mitt—35)

CHLORINE
Environmental Transport
Aqueous chemistry of chlorine: chemistry, analysis, and environmental fate of reactive oxidant species, 7:32528 (ORNL/TM—7788)
Toxicity
Combined effects of nickel, chlorine, and temperature on the mortality of rainbow trout, Salmo gairdneri, 7:32589
Water Chemistry
Aqueous chemistry of chlorine: chemistry, analysis, and environmental fate of reactive oxidant species, 7:32528 (ORNL/TM—7788)

CHLORINE ISOTOPES
Isotope Separation
Mound Facility activities in chemical and physical research: January-June 1981, 7:31825 (MLM—2884)

CHONDROSARCOMAS
See SARCOMAS

CHROMIUM
Leaching
Trace element characterization of coal wastes. Fifth annual progress report, October 1, 1979-September 30, 1980, 7:31728 (LA—8826-PR)

CHROMIUM ALLOYS
See also CHROMIUM STEELS
Solubility
Investigation into carbon diffusion in multicomponent iron alloys with chromium, nickel, molybdenum and niobium in the range of γ-solid solutions, 7:32145 (FEI—1113)

CHROMIUM HYDRIDES
Atom Transport
Mound Facility activities in chemical and physical research: January-June 1981, 7:31825 (MLM—2884)

CHROMIUM IONS
Emission Spectra
Development of materials for a luminescent solar collector. Annual progress report, Septemer 1, 1979-December 31, 1980, 7:31877 (DOE/ER/04996—2)
Energy Transfer
Development of materials for a luminescent solar collector. Annual progress report, Septemer 1, 1979-December 31, 1980, 7:31877 (DOE/ER/04996—2)
Fluorescence
Development of materials for a luminescent solar collector. Annual progress report, Septemer 1, 1979-December 31, 1980, 7:31877 (DOE/ER/04996—2)

CHROMIUM STEELS
(Steels containing only chromium as alloying element; see also CHROMIUM-NICKEL STEELS.)
Corrosion
Flow and fracture in the fusion environment, 7:32158 (PNL-SA—9759)
Fractures
Flow and fracture in the fusion environment, 7:32158 (PNL-SA—9759)
Materials Testing
Flow and fracture in the fusion environment, 7:32158 (PNL-SA—9759)

CHROMIUM-MOLYBDENUM STEELS
Corrosion
Ferrous alloy metallurgy - liquid-lithium corrosion and welding. Progress report, January 1, 1981-December 31, 1981, 7:32135 (DOE/ER/02313—11)
Fatigue
Ferrous alloy metallurgy - liquid-lithium corrosion and welding. Progress report, January 1, 1981-December 31, 1981, 7:32135 (DOE/ER/02313—11)
Tensile Properties
Long-term strength of Kh13M2S2 in biaxial stressed state, 7:32144 (FEI—1046)
Uses
New stainless steel with a great future: 18Cr-2Mo, 7:32168 (NP—2901006)
Weldability
Ferrous alloy metallurgy - liquid-lithium corrosion and welding. Progress report, January 1, 1981-December 31, 1981, 7:32135 (DOE/ER/02313—11)

CHROMODYNAMICS
See QUANTUM CHROMODYNAMICS

CHROMOSOMES
Genetic Mapping
Regional gene mapping of human chromosomes purified by flow sorting, 7:32544

CLIMATES
Global Aspects
Global CO_2 buildup and possible climate modification, 7:32480 (PNL-SA—9311)
Mathematical Models
Geochemical and geophysical models of the fossil-fuel CO_2 climate problem. Semiannual progress report, February 2, 1981-August 31, 1981, 7:32473 (DOE/EV/10610—01)

CLINCH RIVER BREEDER REACTOR
Fission Products
Analysis of the lumped fission-product uncertainty in CRBR, 7:31943 (CONF-811103—69)
Reactivity Worths
Analysis of the lumped fission-product uncertainty in CRBR, 7:31943 (CONF-811103—69)
Reactor Safety
Method of analysis of CRBRP transients for the steam generator, 7:32035
Steam Generators
Method of analysis of CRBRP transients for the steam generator, 7:32035

Sodium-water reaction testing in support of LMFBR steam generator development, 7:32034
Test Facilities
Sodium-water reaction testing in support of LMFBR steam generator development, 7:32034
COAL
See also BITUMINOUS COAL
BLACK COAL
SOLVENT-REFINED COAL
SUBBITUMINOUS COAL
Combustion
Combustion enhancement and pollutant control research with acoustically induced mixing. Technical progress report, September 1981-December 1981, 7:31741 (DOE/PC/40270—3)
Potential for use of peat blends with coal for electric power generation, 7:31743
Fluidized-Bed Combustion
Biological monitoring of fluidized bed coal combustion operations. II. Mammalian responses following exposure to gaseous effluents, 7:32591
Biological monitoring of fludized bed coal combustion operations. I. Increased mutagenicity during periods of incomplete combustion, 7:32592
Procurement
Status of coal supply contracts for new electric generating units, 7:31744 (FERC—0069)
Severance Tax
Severance taxes on coal and uranium in the sunbelt, 7:31745
COAL GASIFICATION
See also IN-SITU GASIFICATION
Research Programs
Assessment of health, safety and environmental impacts of DOE coal conversion process. First technical progress report, 2 July 1980-31 March 1981, 7:31746 (DOE/ET/14746—1)
COAL GASIFICATION PLANTS
Health Hazards
Assessment of health, safety and environmental impacts of DOE coal conversion process. First technical progress report, 2 July 1980-31 March 1981, 7:31746 (DOE/ET/14746—1)
Safety
Assessment of health, safety and environmental impacts of DOE coal conversion process. First technical progress report, 2 July 1980-31 March 1981, 7:31746 (DOE/ET/14746—1)
Site Selection
Illinois synthetic-fuels facilities-siting survey. Document No. 81/36, 7:32524 (NP—2903328)
Waste Management
Assessment of health, safety and environmental impacts of DOE coal conversion process. First technical progress report, 2 July 1980-31 March 1981, 7:31746 (DOE/ET/14746—1)
COAL INDUSTRY
Investment
Investment requirements in the energy sector and their financing, 7:32097 (NP—2901055)
COAL LIQUEFACTION
Catalysts
Preparation of bimodal aluminas an molybdena/alumina extrudates, 7:31721
Chemical Reactors
Optimization studies of various coal-conversion systems. Quarterly report Nos. 1 and 2, May 1, 1981-July 13, 1981 and August 1, 1981-October 31, 1981, 7:31716 (DOE/PC/40778—T1)
Study of multiphase flow useful to understanding scaleup of coal-liquefaction reactors. Technical progress report, September 1, 1981-November 30, 1981, 7:31717 (DOE/PC/40797—1)
Environmental Effects
Assessing health and environmental effects of a developing fuel technology, 7:32536
Environmental Impacts
Toxicity of a coal liquefaction product to aquatic organisms, 7:32593
Health Hazards
Assessing health and environmental effects of a developing fuel technology, 7:32536
Research Programs
Assessment of health, safety and environmental impacts of DOE coal conversion process. First technical progress report, 2 July 1980-31 March 1981, 7:31746 (DOE/ET/14746—1)
COAL LIQUEFACTION PLANTS
Health Hazards
Assessment of health, safety and environmental impacts of DOE coal conversion process. First technical progress report, 2 July 1980-31 March 1981, 7:31746 (DOE/ET/14746—1)
Safety
Assessment of health, safety and environmental impacts of DOE coal conversion process. First technical progress report, 2 July 1980-31 March 1981, 7:31746 (DOE/ET/14746—1)
Waste Management
Assessment of health, safety and environmental impacts of DOE coal conversion process. First technical progress report, 2 July 1980-31 March 1981, 7:31746 (DOE/ET/14746—1)
COAL LIQUIDS
Phase Studies
Phase equilibrium properties of coal derived liquids. Technical progress report, July-December 1981, 7:31725 (DOE/PC/30230—23)
Thermodynamic Properties
Phase equilibrium properties of coal derived liquids. Technical progress report, July-December 1981, 7:31725 (DOE/PC/30230—23)
Toxicity
Toxicity of a coal liquefaction product to aquatic organisms, 7:32593
COAL MINING
See also LONGWALL MINING
SURFACE MINING
UNDERGROUND MINING
Demonstration Programs
Cross-ridge mountaintop mining. Subphase III-X. Technical progress report, June 1, 1979-January 31, 1980, 7:31732 (DOE/ET/13354—T1)
Site Selection
Cross-ridge mountaintop mining. Subphase III-X. Technical progress report, June 1, 1979-January 31, 1980, 7:31732 (DOE/ET/13354—T1)
COAL PREPARATION
Crushing
Trends of development in opencast mining at increased diesel prices, 7:32308
COAL PREPARATION PLANTS
Mineral Wastes
Trace element characterization of coal wastes. Fifth annual progress report, October 1, 1979-September 30, 1980, 7:31728 (LA—8826-PR)
COAL-DERIVED LIQUIDS
See COAL LIQUIDS
COAL-FIRED GAS TURBINES
Corrosion
Corrosion-erosion test rig for high temperature turbine materials evaluation, 7:31907
Erosion
Corrosion-erosion test rig for high temperature turbine materials evaluation, 7:31907
COAL-FIRED MHD GENERATORS
Radiant Heat Transfer
Correlation between results of zone method and experiment in radiative heat transfer, 7:32106
COASTAL WATERS
Water Pollution
Effects of pollution and the need for long-term monitoring, 7:32531

COATED FUEL PARTICLES
Performance Testing
US/FRG umbrella agreement for cooperation in GCR development. Fuel, fission products, and graphite subprogram. Quarterly status report, July 1, 1981-September 30, 1981, 7:31937 (GA-A—16558)
COATINGS
See also ELECTRODEPOSITED COATINGS
PAINTS
Defects
Fault detection and potential measurements with buried pipes, 7:32259
Mechanical Properties
Magnetron co-sputtering system for coating ICF targets, 7:31822 (UCRL—86160)
COBALT
Complexometry
Effect of organic complexants on the mobility of low level waste radionuclides in soils, 7:31805 (PNL-SA—10019)
Lattice Parameters
Cobalt distribution in $LaNi_4Co$. A neutron diffraction study, 7:32209 (IA—1364)
Crystallographic structure of LaNisub(4)CoDsub(y). A neutron diffraction study, 7:32210 (IA—1364)
Leaching
Trace element characterization of coal wastes. Fifth annual progress report, October 1, 1979-September 30, 1980, 7:31728 (LA—8826-PR)
Sorption
Effect of organic complexants on the mobility of low level waste radionuclides in soils, 7:31805 (PNL-SA—10019)
COBALT 60
Biological Availability
Transfer of the corrosion nuclides ^{59}Fe, ^{54}Mn, ^{65}Zn, and ^{60}Co from ground to vegetation, 7:32514 (INIS-mf—6902)
Radionuclide Migration
Transfer from vegetation to meat, 7:32519 (INIS-mf—6902)
Transfer of the corrosion nuclides ^{59}Fe, ^{54}Mn, ^{65}Zn, and ^{60}Co from ground to vegetation, 7:32514 (INIS-mf—6902)
COBALT COMPLEXES
Catalytic Effects
Integrated approach to the systematic synthesis, characterization, and catalytic activity of novel heterogeneous catalysts. Final progress report, 7:32206 (DOE/ER/10381—3)
COLD PLASMA
Relaxed condition for purely ohmic ignition in reversed field pinch configurations, 7:32891 (IPPJ—472)
COLLECTIVE ACCELERATORS
Electron Beam Injection
Ion acceleration in heavy-current electron beam injected in neutral gas, 7:32353 (KFTI—80-45)
COLLECTIVE MODEL
Generator-Coordinate Method
Collective motion and the generator coordinate method, 7:32796 (IFUSP-P—206)
Interacting Boson Model
Interacting sp-boson model with isospin: an unified description of giant multipole resonances and other collective motions, 7:32797 (IFUSP-P—240)
COLLIDING BEAMS
Thermonuclear Reactions
Wrapping screw: An alternative to synchrotron type storage rings for HIF, 7:32351 (GSI—81-2)
COLOR MODEL
Supersymmetry
Technicolour - oasis or mirage, 7:32758 (SLAC—245)
COLUMBIA RIVER BASIN
Aquifers
Solid phases limiting the concentration of dissolved constituents in basalt aquifers of the Columbia Plateau in eastern Washington, 7:32602 (PNL-SA—9848)
COLUMBIUM
See NIOBIUM
COMBINED CYCLES
Energy Demand
Oak Ridge Industrial Model: an introduction, 7:32091 (CONF-801152—3)
COMBINED-CYCLE POWER PLANTS
Coal-Fired Gas Turbines
Corrosion-erosion test rig for high temperature turbine materials evaluation, 7:31907
Gas Turbines
Critical heat flux in the channels of a closed-loop water-cooled turbine, 7:31905
Mechanical, thermal and hydraulic design of a monometallic water-cooled gas turbine nozzle, 7:31906
COMBUSTION PRODUCTS
Air Pollution
Side products and pollutants in combustion processes, 7:32493
Biological Effects
Biological monitoring of fluidized bed coal combustion operations. II. Mammalian responses following exposure to gaseous effluents, 7:32591
Mutagen Screening
Biological monitoring of fludized bed coal combustion operations. I. Increased mutagenicity during periods of incomplete combustion, 7:32592
COMBUSTORS
See also CATALYTIC COMBUSTORS
Operation
Operating experience gained with slag tap furnaces, 7:32306
COMMERCIAL BUILDINGS
Energy Conservation
Energy analysis of retail shops (Denmark), 7:32113 (NP—2900741)
Solar Air Conditioning
Report on assessment of the national program for solar heating and cooling of commercial buildings, 7:31868 (IG—114)
Solar Space Heating
Report on assessment of the national program for solar heating and cooling of commercial buildings, 7:31868 (IG—114)
Solar Water Heating
Report on assessment of the national program for solar heating and cooling of commercial buildings, 7:31868 (IG—114)
COMPOUNDS (ORGANIC)
See ORGANIC COMPOUNDS
COMPRESSORS
See also GAS COMPRESSORS
Subsonic Flow
Calculation of the flow in axial-flow compressors by means of a 2-dimensional method, considering the flow in the side-wall boundary layer and the secondary flow, 7:32277 (NP—2901095)
COMPUTER CODES
A Codes
ADSERV computer code for data processing from proportional chambers, 7:32401 (ITEF—176(1980))
User's manual for the AMEER flight path-trajectory simulation code, 7:32922 (SAND—80-2056)
B Codes
Radioimmunoassay data processing (BASRIA). Software, 7:32548 (PB—82-121971)
D Codes
Combined depth profiling and thermal desorption of implanted deuterium in 304LN stainless steel (Diffuse Code), 7:32167
DIAMANT 2: a multigroup neutron-transport program for triangular and hexagonal geometry, 7:31975 (ORNL-tr—4797)
F Codes
FEDSOL: economic optimization guide for solar federal buildings projects. Model-simulation, 7:31833 (PB—82-135260)
G Codes
GFUN3D program for computerizing three-dimensional magntostatic fields, 7:32914 (JINR—9-81-304)
H Codes
Modeling turbine-missile impacts using the HONDO finite-element code, 7:32033 (SAND—80-2627)
L Codes
LFTPLT8: plotter program for RELAP5 code, 7:32029 (JAERI-M—9359)

M Codes
Model for H^-, D^- production by hydrogen backscattering form alkali and alkali/transition-metal surfaces (Marlowe Code), 7:32907
N Codes
Computer code for neutron group calculation of a cylindrical reactor cell (NEGR-Ts), 7:31969 (IAE—3377/5)
NENEG: programma per la generazione automatica di reticoli per codici di calcolo ad elementi finiti tridimensionali, 7:32912 (CNEN-RT/ING—80-27)
P Codes
"PROSPEC" computer program complex for automatic processing of multidimensional gamma-gamma coincidence spectra, 7:32403 (JINR—10-81-159)
Computer code for calculating reactor core optimal physical performances. POISK-2, 7:31965 (FEI—1110)
PROFP-Y: a computer code for producing nuclear data library of fission products, 7:32776 (JAERI-M—9714)
R Codes
Radioimmunoassay data processing (RIAPROG) - 4th edition. Software, 7:32547 (PB—82-121955)
T Codes
Best estimate radiation heat transfer model developed for TRAN-BD1, 7:32043
V Codes
VNAP2: a computer program for computation of two-dimensional, time-dependent, compressible, turbulent flow, 7:32276 (LA—8872)

COMPUTER NETWORKS
Data Acquisition Systems
EPROM-based LSI-11 for distributed instrumentation control, 7:32929 (UCRL—86500)
Data Base Management
Network file-storage system, 7:32919 (LA-UR—81-3558)
Data Transmission
Remote job entry (RJE) for VAX/VMS user guide, 7:32924 (SAND—81-2476)
Reliability
Service-interruption reporting, 7:32921 (PNL-SA—9984)

CONCRETE-PLASTIC COMPOSITES
Compression Strength
Castable ceramics for hydrothermal environments: materials evaluation for the In-Situ Heat Transfer Experiment, 7:31809 (SAND—81-1882)
Corrosion Resistance
Castable ceramics for hydrothermal environments: materials evaluation for the In-Situ Heat Transfer Experiment, 7:31809 (SAND—81-1882)
Thermal Conductivity
Castable ceramics for hydrothermal environments: materials evaluation for the In-Situ Heat Transfer Experiment, 7:31809 (SAND—81-1882)

CONCRETES
See also PRESTRESSED CONCRETE
Chemical Composition
Water-compatible polymer concrete materials for use in rapid repair systems for airport runways. Final report, 7:32177 (BNL—51390)
Compression Strength
Water-compatible polymer concrete materials for use in rapid repair systems for airport runways. Final report, 7:32177 (BNL—51390)
Curing
Water-compatible polymer concrete materials for use in rapid repair systems for airport runways. Final report, 7:32177 (BNL—51390)
Flexural Strength
Water-compatible polymer concrete materials for use in rapid repair systems for airport runways. Final report, 7:32177 (BNL—51390)

CONSERVATION (ENERGY)
See ENERGY CONSERVATION

CONSOLES
Study for standardization of nuclear power plant control panels, 7:31997 (KAERI/RR—224/80)

CONTAINERS
See also PRESSURE VESSELS
Corrosion
High-level waste immobilization program. Quarterly report, October-December 1979, 7:31800 (PNL-SA—8408)
Stress Analysis
Detailed analysis of the dynamic behavior of the JT-60 vacuum vessel under the saddle-like electromagnetic forces, 7:32896 (JAERI-M—9242)

CONTAINMENT BUILDINGS
Impact Shock
Modeling turbine-missile impacts using the HONDO finite-element code, 7:32033 (SAND—80-2627)
Missile Protection
Modeling turbine-missile impacts using the HONDO finite-element code, 7:32033 (SAND—80-2627)
Pressure Suppression
Full-Scale Mark II CRT program data report No. 10 (TEST 1203) (BWR), 7:32030 (JAERI-M—9403)
Full-Scale Mark II CRT program data report No. 11 (TEST 1204) (BWR), 7:32031 (JAERI-M—9404)

CONTAINMENT SYSTEMS
Analysis of pressure oscillations and pressure spikes in the Marviken pressure suppression containment, 7:32025 (GKSS—81/E/27)
Analysis of fluid-structure interaction in pressure suppression systems type 69 during steam condensation, 7:32026 (GKSS—81/E/27)
Mark III Confirmation Test Program, 7:32021 (GKSS—81/E/27)
Modal analysis of the GKSS-PSS-wet well, 7:32028 (GKSS—81/E/27)
Multi-vent system problems, 7:32023 (GKSS—81/E/27)
Multi-vent effects on the dynamic pressure caused by chugging, 7:32024 (GKSS—81/E/27)
Recent research at MIT on fluid-structure interactions, chugging, and scaling laws for SRV discharges, 7:32027 (GKSS—81/E/27)
Review of GKSS 3-vent experimental program and results, 7:32022 (GKSS—81/E/27)
State of JAERI Full-Scale Mark II CRT Program, 7:32020 (GKSS—81/E/27)
State of pressure suppression containment research in the Federal Republic of Germany, 7:32019 (GKSS—81/E/27)

CONTRACTS
Monitoring
Cost and Schedule Control Systems Criteria for Contract Performance Measurement: Systems Review/Surveillance Guide, 7:32910 (DOE/MA—0047)

CONTROL EQUIPMENT
Design
Environmental chamber low temperature cutoff. Final report, 7:32248 (BDX—613-2722)
Operation
Environmental chamber low temperature cutoff. Final report, 7:32248 (BDX—613-2722)

CONTROL ROOMS
Consoles
Study for standardization of nuclear power plant control panels, 7:31997 (KAERI/RR—224/80)

CONTROL SYSTEMS
(For automated processes including feedback.)
Variable gain for a wind turbine pitch control, 7:31898 (DOE/NASA/20320—34)

CONTROL THEORY (REACTOR)
See REACTOR KINETICS

CONVERTERS (ANALOG-DIGITAL)
See ANALOG-TO-DIGITAL CONVERTERS

CONVEYORS
Damage
Rehabilitation of a coal conveyor system at Frimmersdorf power station following a fire, 7:31909
Fires
Rehabilitation, reinforcement and safety of steel structures, 7:32295
Rehabilitation of a coal conveyor system at Frimmersdorf power station following a fire, 7:31909

Safety Engineering
Rehabilitation of a coal conveyor system at Frimmersdorf power station following a fire, 7:31909
Supports
Rehabilitation of a coal conveyor system at Frimmersdorf power station following a fire, 7:31909
COOLERS
See HEAT EXCHANGERS
COOLING LOAD
Computer Calculations
Influence of buildings geometrical and physical parameters on thermal cooling load, 7:32111 (INIS-mf—6766)
COOLING SYSTEM (REACTOR)
See REACTOR COOLING SYSTEMS
COOLING TOWERS
Plumes
Mathematical modelling of the atmospheric distribution of cooling tower plumes, 7:32495
COPPER
Electroplating
Electroplating workshop, 7:32219 (GSI—81-2)
Leaching
Trace element characterization of coal wastes. Fifth annual progress report, October 1, 1979-September 30, 1980, 7:31728 (LA—8826-PR)
Neutron Diffraction
Study of material science by neutron scattering, 7:32814 (KAERI/RR—267/80)
Proton Reactions
Study on the neutron yield from thick targets under the action of 645 MeV protons, 7:32766 (JINR—18-80-540)
X-Ray Spectra
Application of a position sensitive proportional counter for an X-ray transmission spectrometer, 7:32380 (GSI—81-2)
COPPER 61
Energy Levels
Intermediate structure in proton resonances, 7:32771 (JINR-R—15-80-786)
COPPER 64 TARGET
Hadron Reactions
Hadron-nucleon inelastic collision mean free path in nuclear matter, 7:32777 (JINR—E-1-80-799)
COPPER ALLOYS
Mechanical Properties
Application of high-strength copper alloys for a fusion-reactor first wall, 7:32141 (DOE/ER/10107—9)
CORNELL ELECTRON-POSITRON STORAGE RING
See CESR STORAGE RING
COSMIC GASES
Chemical Reactions
Synthesis of life related molecules in interstellar space, 7:32687
COSMIC MUONS
Correlation of the high energy muons with the size of the air showers associated, 7:32685
COSMIC PARTICLES
See COSMIC RADIATION
COSMIC RADIATION
See also PRIMARY COSMIC RADIATION
Energy Spectra
Analytic model for the differential energy spectra of cosmic rays, 7:32609
COSMIC RAY DETECTION
Cherenkov Counters
Applications of the Cleveland salt mine detector to cosmic rays and cosmology, 7:32437
Dielectric Track Detectors
Detection of heavy nuclei in the plastic track detector CR-39, 7:32686
DUMAND Project
Characteristics of electronics components under high pressure, 7:32429
Oceanographic studies for Dumand, 7:32430
Errors
Evaluation of systematic errors affecting measurements of radial distributions of particles or subcores about air shower axes, 7:32674
Extensive Air Showers
Satellite observation of cosmic ray air showers, 7:32610
COSMOLOGICAL MODELS
Unified Gauge Models
Early Universe, 7:32607
COUNTERS (RADIATION)
See RADIATION DETECTORS
COUNTING CIRCUITS
Remote Control
Computerized electronics for nuclear research, 7:32375 (GSI—81-2)
Research Programs
Experimental electronics group (Elektronik/Experimente), 7:32378 (GSI—81-2)
CRBR REACTOR
See CLINCH RIVER BREEDER REACTOR
CREEKS
See RIVERS
CRITICAL ASSEMBLIES
See ZERO POWER REACTORS
CROPS
Energy Source Development
Competitive capability of energy crops for arable land, 7:31837 (DFE—35)
CROSS SECTIONS
Ion-Atom Collisions
Ionization cross sections for ion-atom and ion-molecule collisions, 1. Ionization cross sections for H^+, H_2^+, H_3^+, He^+ and He^{++} incident on H, H_2 and He, 7:32704 (JAERI-M—9310)
Ion-Molecule Collisions
Ionization cross sections for ion-atom and ion-molecule collisions, 1. Ionization cross sections for H^+, H_2^+, H_3^+, He^+ and He^{++} incident on H, H_2 and He, 7:32704 (JAERI-M—9310)
CROSSED BEAMS
See COLLIDING BEAMS
CRYOGENIC BUBBLE CHAMBERS
Deuterium Target
Expansion device for a track-sensitive deuterium target, 7:32405 (JINR—13-80-808)
Image Processing
Xenon bubble chamber image processing on the POISK installation in the man-machine dialog regime, 7:32400 (ITEF—168(1980))
Interactive Display Devices
Xenon bubble chamber image processing on the POISK installation in the man-machine dialog regime, 7:32400 (ITEF—168(1980))
CRYOGENICS
Containers
Cryogenic-container suspension strap: a supporting strap has low thermal conductivity. NTIS Tech Note, 7:32253 (PB—81-970073)
CRYOPUMPS
Ion Beam Injection
Experiment of long pulse beam injection into cryopump, 7:32895 (JAERI-M—9213)
CRYSTAL DOPING
Depth
Statistical sputtering contribution to resolution in concentration-depth profiles, 7:32291
Sputtering
Statistical sputtering contribution to resolution in concentration-depth profiles, 7:32291
CRYSTAL LATTICES
Biological Materials
Diffraction from crystals. Chapter 6.5. Neutron diffraction structure analysis, 7:32818
Energy-Level Density
Transfer matrix treatment for linear chains with long range interactions, 7:32838 (PUC-tn—17/80)
Group Theory
Renormalization group treatment of bond percolation in anisotropic and 'inhomogeneous' planar lattices, 7:32826 (CBPF-A—0013/80)

Laves Phases
Orientation ordering (anti k=0) in interstitial solid solutions on the base of cubic (C-15) Laves phases, 7:32833 (IAE—3308/9)
Neutron Diffraction
Diffraction from crystals. Chapter 6.5. Neutron diffraction structure analysis, 7:32818
Dynamical susceptibility and neutron scattering cross section of a model mixed-valence system, 7:32821
Phase Diagrams
Percolation with first-and-second neighbour bonds: a renormalization-group calculation of critical exponents, 7:32837 (PUC-tn—05/80)
Remarks on the percolation problem in anisotropic systems, 7:32839 (PUC-tn—18/79)

CRYSTAL-PHASE TRANSFORMATIONS
Magnetism
Random magnetism, 7:32825 (CBPF-A—0010/80)

CURIUM
Ion Exchange Chromatography
Possibility of chromatographic separation of curium and californium on phosphorus- and phosphorus-nitrogen-containing ionites, 7:32191 (IAE—3303/13)
Radionuclide Migration
Transfer of plutonium, americium, and curium from ground to vegetation through plant roots, 7:32512 (INIS-mf—6902)
Root Absorption
Transfer of plutonium, americium, and curium from ground to vegetation through plant roots, 7:32512 (INIS-mf—6902)
Sputtering
Target sputtering by multicharged heavy ion beams, 7:32711 (RI—120)

CURIUM 248 TARGET
Fabrication
Preparation of ^{248}Cm sources for experiments with heavy ions, 7:32347 (GSI—81-2)
Testing
Tests of curium metal targets for the synthesis of superheavy elements, 7:32348 (GSI—81-2)

CUSP
See CUSPED GEOMETRIES

CUSPED GEOMETRIES
Plasma Confinement
Simulation of plasma confinement in RF plugged cusp field, 7:32861 (IPPJ—477)
Plasma Simulation
Simulation of plasma confinement in RF plugged cusp field, 7:32861 (IPPJ—477)
Plugging
Simulation of plasma confinement in RF plugged cusp field, 7:32861 (IPPJ—477)

CYANIDES
Electronic Structure
Electronic structure and Moessbauer hyperfine interactions of Au (I) compounds, 7:32827 (CBPF-A—0022/80)

CYCLOHEXANE
Fluorescence
Contribution of electronically excited states to the radiation chemistry of organic systems. Progress report, September 1, 1980-November 30, 1981, 7:32221 (DOE/ER/00913—2)

D

DATA ACQUISITION SYSTEMS
See also CAMAC SYSTEM
Computer Networks
EBT data acquisition system control facilities, 7:32920 (ORNL/CSD/TM—166)
Data Processing
Method of parallel processing in SANPO real time system, 7:32916 (JINR-R—10-81-342)
Real Time Systems
Applying structured analysis in a real-time data acquisition environment, 7:32928 (UCRL—86341)
Testing
FASTBUS demonstration systems, 7:32926 (SLAC-PUB—2835)

DAYLIGHTING
Simulation
Development and use of a hemispherical sky simulator, 7:32112 (LBL—13400)

DECISION MAKING
Mathematical Models
Decision framework for technology choice. Volume 1. A case study of one utility's coal-nuclear choice, 7:32098 (EPRI-EA—2153-Vol.1)

DEFORMED NUCLEI
Nuclear Structure
Collective two-phonon states in deformed nuclei, 7:32784 (JINR-R—4-81-148)
Quasiparticle-Phonon Model
Collective two-phonon states in deformed nuclei, 7:32784 (JINR-R—4-81-148)

DELAYED NEUTRON ANALYSIS
Comparative Evaluations
Comparative study of some methods for the determination of uranium used at the Instituto de Pesquisas Energeticas e Nucleares, 7:32193 (IPEN-Pub—17)

DEMONSTRATION PROGRAMS
Program Management
Report on assessment of the national program for solar heating and cooling of commercial buildings, 7:31868 (IG—114)

DENDRITIC WEB GROWTH METHOD
Cost
Sensitivity analysis of the add-on price estimate for the silicon web growth process, 7:31838 (DOE/JPL—1012-61)

DENMARK
Planning of heat supply. Instruction 1. Surveying, 7:32095 (NP—2900614)
Insolation
Incident solar radiation and solar heating systems -measured and calculated, 7:31867 (DTH-LV-MEDD—106)

DENSITOMETERS
Performance Testing
Advanced two-phase instrumentation program. Quarterly progress report, July-September 1981 (PWR), 7:31929 (NUREG/CR—2204-Vol.3)

DEOXYPENTOSE NUCLEIC ACID
See DNA

DEOXYRIBONUCLEIC ACID
See DNA

DESOXYRIBONUCLEIC ACID
See DNA

DESULFURIZATION
See also LIME-LIMESTONE WET SCRUBBING PROCESSES
Energy Demand
Oak Ridge Industrial Model: an introduction, 7:32091 (CONF-801152—3)
Market
Oak Ridge Industrial Model: an introduction, 7:32091 (CONF-801152—3)

DETECTORS (RADIATION)
See RADIATION DETECTORS

DEUTERIUM
Chemical Reactions
Mound Facility activities in chemical and physical research: January-June 1981, 7:31825 (MLM—2884)
Desorption
Release of H and He from TiC, stainless steel, and graphite by pulsed electron and furnace heating, 7:32906
Trapping, detrapping and replacement of KeV hydrogen implanted into graphite, 7:32908
Differential Cross Sections
Collisional processes of interest in MFE plasma research. Annual report, October 1, 1980-September 30, 1981, 7:32696 (DOE/ET/53025—T10)
Isotope Effects
^{2}D and ^{133}Cs NMR study of the hydrogen bond network and antiferroelectric phase transition of cesium trihydrogen selenite, 7:32214

Hydrogenolysis of carbon and its catalysis by platinum, 7:31722
Order-disorder transition in Sr_3IrD_5: evidence for square pyramidal IrD_5 units from powder neutron diffraction data, 7:32176
Mesic Molecules
Possible effect of strong interaction on mesic molecule systems properties, 7:32706 (JINR-R—4-81-72)
Trapping
Trapping, detrapping and replacement of KeV hydrogen implanted into graphite, 7:32908
DEUTERIUM IONS
Collisions
Monte Carlo calculations of light-ion sputtering as a function of the incident angle, 7:32716
Desorption
Combined depth profiling and thermal desorption of implanted deuterium in 304LN stainless steel (Diffuse Code), 7:32167
Differential Cross Sections
Collisional processes of interest in MFE plasma research. Annual report, October 1, 1980-September 30, 1981, 7:32696 (DOE/ET/53025—T10)
Diffusion
Combined depth profiling and thermal desorption of implanted deuterium in 304LN stainless steel (Diffuse Code), 7:32167
Energy Spectra
Energy and angular distribution of low energy H^+ and D^+ backscattered from polycrystalline carbon, 7:32714
Ion-Atom Collisions
Energy and angular distribution of low energy H^+ and D^+ backscattered from polycrystalline carbon, 7:32714
Mathematical Models
Model for H^-, D^- production by hydrogen backscattering form alkali and alkali/transition-metal surfaces (Marlowe Code), 7:32907
Production
Model for H^-, D^- production by hydrogen backscattering form alkali and alkali/transition-metal surfaces (Marlowe Code), 7:32907
Trapping
Combined depth profiling and thermal desorption of implanted deuterium in 304LN stainless steel (Diffuse Code), 7:32167
DEUTERIUM TARGET
Deuteron Reactions
Elastic d-d small angle scattering at 4.6 GeV/c, 7:32725 (JINR—1-81-82)
Specifications
Expansion device for a track-sensitive deuterium target, 7:32405 (JINR—13-80-808)
DEUTERON REACTIONS
Elastic Scattering
Elastic d-d small angle scattering at 4.6 GeV/c, 7:32725 (JINR—1-81-82)
DEUTERON-DEUTERON INTERACTIONS
See DEUTERIUM TARGET
DEUTERON REACTIONS
DEVONIAN SHALES
See BLACK SHALES
DI-2-ETHYLHEXYLPHOSPHORIC ACID
See HDEHP
DIABLO CANYON-1 REACTOR
Shock Absorbers
Snubber design applications, 7:31934
DIAMOND DRILLING EQUIPMENT
See DRILLING EQUIPMENT
DIAMONDS
Electron Collisions
Effect of electron beam parameters on the coherent bremsstrahlung in monocrystals, 7:32810 (IFVE-OP—81-17)
DIELECTRIC MATERIALS
Technology Assessment
Thick film materials and discrete passive components, 7:32467 (SAND—82-0425)
Temperature Effects
Thick film materials and discrete passive components, 7:32467 (SAND—82-0425)
DIELECTRICS
See DIELECTRIC MATERIALS
DIES
Design
Method and apparatus for drawing monocrystalline ribbon from a melt (Patent), 7:32186
DIESEL FUELS
Decomposition
Accelerated stability test techniques for middle distillate fuels, 7:31756
Army needs for diesel fuel stability and cleanliness, 7:31761
du Pont F21 149°C (300°F) accelerated stability test, 7:31757
Stability
Accelerated stability test techniques for middle distillate fuels, 7:31756
Army needs for diesel fuel stability and cleanliness, 7:31761
Distillate-fuel stability and cleanliness, 7:31755
du Pont F21 149°C (300°F) accelerated stability test, 7:31757
Stability of diesel fuels made from shale oil, 7:31775
Storage
Accelerated stability test techniques for middle distillate fuels, 7:31756
du Pont F21 149°C (300°F) accelerated stability test, 7:31757
DIFFERENTIAL EQUATIONS
See also NEUTRON DIFFUSION EQUATION
Numerical Solution
Solving ordinary differential equations with discontinuities, 7:32930 (UIUCDCS-R—81-1064)
Type-insensitive ODE codes, 7:32925 (SAND—82-0061C)
DIFFUSION BARRIERS
Alloys
Amorphous metal diffusion barriers, 7:31887 (SAND—82-0425)
Performance
Amorphous metal diffusion barriers, 7:31887 (SAND—82-0425)
3,4-DIHYDROXYPHENYLALANINE
See DOPA
DIMETHYLKETONE
See ACETONE
2-2-DIMETHYLPROPANE
Electron Mobility
Dependence of conduction band energy and electron mobility on fluid density, 7:32226
DIOLS
See GLYCOLS
DISPERSED STORAGE AND GENERATION
Interconnected Power Systems
Integrating new sources into utility systems, 7:32102
DISTILLATION EQUIPMENT
Computerized Simulation
Methods to calculate equilibrium tray, 7:32281
DISTRICT HEATING
Planning
Planning of heat supply. Instruction 1. Surveying, 7:32095 (NP—2900614)
DIVERTORS
Design
Engineering design of a toroidal divertor for the EBT-S fusion device. Final report, Phase II. EBT-S divertor project, 7:32901 (ORNL/Sub—81/21086/2)
Meetings
Proceedings of the US/Japan workshop on divertors, first wall materials, and impurity control. Exchange Al in the US-Japan fusion cooperation program, 7:32894 (JAERI-M—8971)
DNA
(Deoxyribonucleic acid.)
Biological Repair
Measurement of gap filling by bromouracil photolysis, 7:32582
Measurement of repair synthesis by photolysis of bromouracil, 7:32583
Configuration Interaction
Nucleic acid-protein interactions: conformational studies. Progress report, September 1, 1978-August 31, 1981, 7:32541 (DOE/EV/04962—3)
Electrophoresis
Regional gene mapping of human chromosomes purified by flow sorting, 7:32544

Extraction
Regional gene mapping of human chromosomes purified by flow sorting, 7:32544
Hybridization
Regional gene mapping of human chromosomes purified by flow sorting, 7:32544
Metabolism
DNA turnover in nonproliferation tissues, 7:32546
Structural Chemical Analysis
Nucleic acid-protein interactions: conformational studies. Progress report, September 1, 1978-August 31, 1981, 7:32541 (DOE/EV/04962—3)

DOPA
(3,4-Dihydroxyphenylalanine.)
Pharmacology
Chronopharmacology of L-DOPA: implications for orthochronal therapy in the prevention of circadian dyschronism, 7:32568

DOPING (CRYSTAL)
See CRYSTAL DOPING

DORMITORIES
See RESIDENTIAL BUILDINGS

DOSEMETERS
See also CHEMICAL DOSEMETERS
Calibration
Correcting overlapping counts in dose calibrations at high event density, 7:32381 (GSI—81-2)

DOSE-RESPONSE RELATIONSHIPS
Age Dependence
Use of a demographic model for health risk assessment, 7:32590

DOSIMETRY
See also NEUTRON DOSIMETRY
Meetings
Problems on dosimetry and radiation protection. No. 19, 7:32822 (INIS-SU—39)

DOWTHERM
See BIPHENYL

DRIFT CHAMBERS
Efficiency
Pressurised position sensitive detector for gamma detection, 7:32413 (JINR-R—13-81-298)
Gamma Detection
Pressurised position sensitive detector for gamma detection, 7:32413 (JINR-R—13-81-298)
Performance Testing
Optimization of drift chamber parameters with wide drift gaps using Ar+CO_2 working mixture, 7:32396 (IFVE-ONF—81-24)

DRILLING
See also WELL DRILLING
Manuals
Manual of the drilling technology, 7:32252 (NP—2900949)

DRILLING EQUIPMENT
Manuals
Manual of the drilling technology, 7:32252 (NP—2900949)
Marketing Research
Market for drilling rigs (petroleum, natural gas), 7:31751 (NP—2901091)

DRILLING FLUIDS
Chemical Analysis
Chemical logging of geothermal wells (Patent), 7:31891

DRILLING MUD
See DRILLING FLUIDS

DRILLING PLATFORMS
See OFFSHORE PLATFORMS

DRILLING RIGS
Marketing Research
Market for drilling rigs (petroleum, natural gas), 7:31751 (NP—2901091)

DROPLETS
Production
Study of droplet formation for preparation of spheres by internal gelation, 7:31799 (ORNL/MIT—337)

D-T REACTORS
Plasma Simulation
One-dimensional transport code for the simulation of D-T burning tokamak plasma. POISE 1, 7:32872 (JAERI-M—9167)
Storage Rings
Storage ring problems in the HIBALL-scenario, 7:32361 (GSI—81-2)

DUMAND PROJECT
Advances in detectors for Dumand arrays, 7:32427
Characteristics of electronics components under high pressure, 7:32429
Experiment project of $\mu\nu$ detection in shallow underwater, 7:32435
Fluorescent light detector in Dumand, 7:32428
Muons with high energy transfer in Dumand, 7:32432
Sensitivity of Dumand arrays to extraterrestrial neutrino fluxes, 7:32434
Separation of hadronic and electromagnetic interactions of muons in Dumand, 7:32433
Ultra high energy primary composition and interaction studies with Dumand, 7:32431
Site Selection
Oceanographic studies for Dumand, 7:32430

DUSTS
Control
Technical progress report No. 5, December 1-December 31, 1981, 7:31734 (FMA-BM—8148-81)
Explosions
Avoiding static charges in filter materials by using metal fibres, 7:32301

DYSPROSIUM 149
Beta-Plus Decay
^{149}Dy beta decay and ^{149}Tb excited states, 7:32780 (JINR-R—6-81-23)

E

EARTH ATMOSPHERE
See also AIR
STRATOSPHERE
SURFACE AIR
Boundary Layers
Interaction of the atmospheric boundary layer with large-scale processes over the Bay of Bengal during MONEX79, 7:32472 (BNL—30322)

EARTHQUAKES
Comparison of LMFBR piping response obtained using response spectra and time history methods, 7:32049
Dynamic analysis techniques--a sensitivity study for piping systems at a nuclear power plant, 7:32065

EBR-2 REACTOR
After-Heat Removal
Operational safety and reliability research at EBR-II, 7:32041
Fuel Pins
Operational safety and reliability research at EBR-II, 7:32041
Reactor Safety
Operational safety and reliability research at EBR-II, 7:32041
Steam Generators
Operating experience of the EBR-II steam generating system, 7:31951

ECCS
(Emergency core cooling system.)
Heat Transfer
Experimental study of safety injection and reflooding (PWR; BWR), 7:32032 (KAERI/RR—231/80)
Hydraulics
Experimental study of safety injection and reflooding (PWR; BWR), 7:32032 (KAERI/RR—231/80)

ECOLOGY
See also RADIOECOLOGY
Ecology (Book), 7:32496

ECR HEATING
Efficiency
Efficiency of plasma electron cyclotron-resonance heating in the TM-3 tokamak, 7:32855 (IAE—3324/7)
EDDY CURRENT TESTING
Manuals
Eddy-current testing: manual on eddy-current method, 7:32442 (AECL—7523-Vol.1)
EDUCATIONAL TOOLS
Inventories
Energy education programs, 7:32125 (DOE/IR/10905—20)
EINSTEIN-DE SITTER MODEL
See COSMOLOGICAL MODELS
EINSTEINIUM
Chemical Properties
Chemical properties of the heavier actinides and transactinides, 7:32237 (UCRL—85944)
Electronic Structure
Chemical properties of the heavier actinides and transactinides, 7:32237 (UCRL—85944)
EKA-OSMIUM
See ELEMENT 108
EKA-TANTALUM
See ELEMENT 105
EKA-TUNGSTEN
See ELEMENT 106
EKU
See EREVAN SYNCHROTRON
ELASTOMERS
Field Tests
High temperature Y267 EPDM elastomer field and laboratory experiences, August 1981, 7:31894 (SAND—82-0425)
Materials Testing
High temperature Y267 EPDM elastomer field and laboratory experiences, August 1981, 7:31894 (SAND—82-0425)
ELECTRIC BATTERIES
(Devices for production and/or storage of electrical energy from chemical reactions; excludes FUEL CELLS and RADIOISOTOPE BATTERIES.)
See also LEAD-ACID BATTERIES
THERMAL BATTERIES
Performance Testing
Vehicle test report: Electric Vehicle Associates electric conversion of an AMC Pacer, 7:32129 (DOE/CS/54209—4)
Test Facilities
Solid-state high common-mode battery cell voltage scanner: design report, 7:32127 (ANL/OEPM—81-7)
ELECTRIC CONTACTS
Electroplating
Development of copper sulfide/cadmium sulfide thin-film solar cells, 7:31851 (SERI/PR—8143-1-T5)
Vacuum Evaporation
Development of copper sulfide/cadmium sulfide thin-film solar cells, 7:31851 (SERI/PR—8143-1-T5)
ELECTRIC IMPEDANCE
Calculation Methods
Measurements of impedances for determinating the minimum short-circuit current in main systems 500 V of underground mining establishments, 7:32309
Electrical Faults
Measurements of impedances for determinating the minimum short-circuit current in main systems 500 V of underground mining establishments, 7:32309
Measuring Instruments
Measurements of impedances for determinating the minimum short-circuit current in main systems 500 V of underground mining establishments, 7:32309
ELECTRIC POWER
See also BONNEVILLE POWER ADMINISTRATION
Blackouts
Role of the density function of outage energy in the reliability analysis of electric power supply grids, 7:31913
Prices
Growth of energy consumption and prices in the USA, FRG, France, and the UK, 1950-1979, 7:32110 (IIASA-WP—80-126)
ELECTRIC POWER INDUSTRY
Data Compilation
Statistics report '80, 7:32100 (NP—2901048)
Investment
Investment requirements in the energy sector and their financing, 7:32097 (NP—2901055)
Power Generation
Statistics report '80, 7:32100 (NP—2901048)
ELECTRIC POWER RESEARCH INSTITUTE
See EPRI
ELECTRIC PROBES
Photoelectric Effect
Measurement of bubble size distributions in fermentation media using a photoelectric probe, 7:32464
ELECTRIC UTILITIES
Decision Making
Decision framework for technology choice. Volume 1. A case study of one utility's coal-nuclear choice, 7:32098 (EPRI-EA—2153-Vol.1)
Dispersed Storage and Generation
Integrating new sources into utility systems, 7:32102
Load Management
1980 survey and evaluation of utility conservation, load management, and solar end-use projects. Volume 3: utility load management projects. Final report, 7:32099 (EPRI-EM—2193-Vol.3)
Photovoltaic Power Supplies
Intermediate photovoltaic system application experiment operational performance report. Volume 5. Newman Power Station Site, El Paso, TX, 7:31859 (SAND—81-7086/5)
ELECTRICAL FAULTS
Electric Impedance
Measurements of impedances for determinating the minimum short-circuit current in main systems 500 V of underground mining establishments, 7:32309
ELECTRICAL INSULATORS
Fabrication
Preparation of superinsulating surfaces by the nuclear track-technique, 7:32302 (GSI—81-2)
ELECTRIC-POWERED VEHICLES
Design
Near-term electric-vehicle program. Phase II. Mid-term review summary report, 7:32128 (DOE/CS/51213—T20)
Electric Batteries
Solid-state high common-mode battery cell voltage scanner: design report, 7:32127 (ANL/OEPM—81-7)
Performance
Near-term electric-vehicle program. Phase II. Mid-term review summary report, 7:32128 (DOE/CS/51213—T20)
Performance Testing
Vehicle test report: Electric Vehicle Associates electric conversion of an AMC Pacer, 7:32129 (DOE/CS/54209—4)
Safety
Near-term electric-vehicle program. Phase II. Mid-term review summary report, 7:32128 (DOE/CS/51213—T20)
ELECTRODEPOSITED COATINGS
Porosity
Potentiometric determination of percent porosity in nickel electroplates on uranium metal, 7:32161 (Y/DW—282)
ELECTRODES
Electrodeposited Coatings
Enhanced stability of photoelectrodes with electrogenerated polyaniline films, 7:31853 (SERI/TP—211-1494)
Stabilization
Enhanced stability of photoelectrodes with electrogenerated polyaniline films, 7:31853 (SERI/TP—211-1494)
ELECTROMAGNETIC FIELDS
Three-Dimensional Calculations
Three dimensional field computation, 7:32846 (RL—81-054)
ELECTROMAGNETIC ISOTOPE SEPARATORS
Electromagnetic mass separator for heavy element radioisotope separation, 7:31787 (RI—136)
ELECTROMAGNETIC TRANSITIONS
See ENERGY-LEVEL TRANSITIONS
ELECTRON COLLISIONS
See also ELECTRON-MOLECULE COLLISIONS

Bremsstrahlung
Effect of electron beam parameters on the coherent bremsstrahlung in monocrystals, 7:32810 (IFVE-OP—81-17)
ELECTRON CYCLOTRON-RESONANCE H
See ECR HEATING
ELECTRON PARAMAGNETIC RESONANCE
See ELECTRON SPIN RESONANCE
ELECTRON SPECTROMETERS
Tori spectrometer, a new instrument for positron- and electronspectroscopy, 7:32384 (GSI—81-2)
Electrostatic Spectrometers
Experimental setup for high resolution Auger electron and X-ray spectroscopy, 7:32447 (GSI—81-2)
ELECTRON SPIN RESONANCE
Line Widths
Influence of nuclear tracks on ferromagnetic resonance linewidth of yttrium iron garnets, 7:32182 (GSI—81-2)
ELECTRON-BEAM-PUMPED LASERS
See FREE ELECTRON LASERS
ELECTRONIC EQUIPMENT
See also AMPLIFIERS
ANALOG-TO-DIGITAL CONVERTERS
PULSE ANALYZERS
RADIO EQUIPMENT
Energy Consumption
Energy use in three sectors of the electrical-engineering industry, 7:32123
Manufacturing
Energy use in three sectors of the electrical-engineering industry, 7:32123
ELECTRON-MOLECULE COLLISIONS
Ionization
Cross sections for electron impact ionisation of metastable rare-gas excimers ($He_2sup(*)$, $Kr_2sup(*)$, $Xe_2sup(*)$), 7:32712
ELECTRON-POSITRON INTERACTIONS
Annihilation
Research in theoretical physics. Annual progress report, April 1, 1981-March 31, 1982, 7:32738 (DOE/ER/03285—41)
Search for excited leptons in the next generation of experiments, 7:32722 (DOE/ER/03285—40)
Multiple Production
Multihadron production in hadronic, leptonic and nuclear reactions at high energies, 7:32740 (KEK—79-33)
Particle Production
Search for excited leptons in the next generation of experiments, 7:32722 (DOE/ER/03285—40)
Upsilon Resonances
Upsilon physics with CUSB, 7:32422 (SLAC—245)
ELECTRONS
See also TRAPPED ELECTRONS
Cherenkov Radiation
Some peculiarities of the Vavilov-Cherenkov radiation connected with the finite thickness of the radiator, 7:32813 (JINR-R—14-80-793)
Multiple Scattering
Multiple scattering in thin layers of substance, 7:32806 (EFI—431(38)-80)
ELECTROPLATING
Cavity Resonators
Electroplating workshop, 7:32219 (GSI—81-2)
ELECTROSTATIC ACCELERATORS
300 kV accelerator, 7:32316 (GSI—81-2)
ELECTROSTATICS
Evaluation
Catalytic behavior of a cation in a solid solution: an electrostatic potential approach, 7:32220
ELEMENT 105
Spontaneous Fission
Spontaneous fission of heavy isotopes of nielsbohrium (Z = 105) and element 106, 7:32793 (JINR-R—7-12056)
ELEMENT 106
Spontaneous Fission
Spontaneous fission of heavy isotopes of nielsbohrium (Z = 105) and element 106, 7:32793 (JINR-R—7-12056)
ELEMENT 108
Nucleosynthesis
Experiments on the fusion of element 108 in the $^{226}Ra + {}^{48}Ca$ reaction, 7:32792 (JINR-R—7-12054)
ELMO BUMPY TORUS
Data Acquisition Systems
EBT data acquisition system control facilities, 7:32920 (ORNL/CSD/TM—166)
Divertors
Engineering design of a toroidal divertor for the EBT-S fusion device. Final report, Phase II. EBT-S divertor project, 7:32901 (ORNL/Sub—81/21086/2)
Plasma Macroinstabilities
Stability of low-frequency modes in tandem mirrors and bumpy tori, 7:32877 (SAI—254-81-387-LJ)
EMERGENCY CORE COOLING SYSTEM
See ECCS
ENERGY
See also SOLAR ENERGY
Educational Tools
Energy education programs, 7:32125 (DOE/IR/10905—20)
ENERGY CONSERVATION
Meetings
Energy conservation management conference, 7:32089 (CONF-810370—)
Program Management
Energy conservation management conference, 7:32089 (CONF-810370—)
Nebraska Energy Office. Annual report, 1981, 7:32094 (NP—2902311)
Regulations
Ordinance on energy-saving thermal insulation of buildings. Thermal Insulation Ordinance (Waermeschutz V). Dated from August 11, 1977, 7:32115 (NP—2901002)
ENERGY POLICY
Public Opinion
Trade unions present clear attitude concerning energy policy, 7:32079
Socio-Economic Factors
Prospects of energy policy from the view of the Deutscher Gewerkschaftsbund, 7:32078
ENERGY RESEARCH ADVISORY BOARD
Recommendations
Federal energy R and D priorities. Report of the Research and Development Panel, Energy Research Advisory Board, 7:32083 (DOE/TIC—2007065)
ENERGY SHORTAGES
Risk Assessment
Reliability studies in a power plant system, 7:31910
ENERGY SOURCE DEVELOPMENT
Biological Indicators
Statistical evaluation of litterfall data from a forest monitoring study, 7:32498 (PNL-SA—9014)
Environmental Effects
Effects of atmospheric deposition of energy-related pollutants on water quality: a review and assessment, 7:32478 (ANL/AA—26)
Environmental Impacts
Statistical evaluation of litterfall data from a forest monitoring study, 7:32498 (PNL-SA—9014)
ENERGY SUPPLIES
Comparative Evaluations
Discussion on the hard or soft way in future energy supply, 7:32075 (NP—2901424)
Energy Models
Energy-supply model MESSAGE, 7:32074
Global Aspects
Energy-supply model MESSAGE, 7:32074
Planning
Comprehensive Energy Plan (Maine), 7:32093 (NP—2901890)
Discussion on the hard or soft way in future energy supply, 7:32075 (NP—2901424)
Reliability
Role of the density function of outage energy in the reliability analysis of electric power supply grids, 7:31913
ENERGY-LEVEL TRANSITIONS
Inelastic Scattering
Variation of βR with probe in inelastic hadron scattering and adequacy of first-order calculations, 7:32801

ENGINEERED SAFETY SYSTEMS
See also CONTAINMENT SYSTEMS
ECCS
Direct reactor auxiliary cooling system for the 1000-MWE LMFBR developmental plant, 7:32037
ENGINEERING
Standards
Variability of data--standards for applications, 7:32247
ENGLAND
See UNITED KINGDOM
ENRICHED MATERIALS (ISOTOPES)
See ISOTOPE ENRICHED MATERIALS
ENTRAINMENT
Mathematical Models
Impact of entrainment and impingement on fish populations in the Hudson River estuary. Volume I. Entrainment-impact estimates for six fish populations inhabiting the Hudson River estuary, 7:32526 (NUREG/CR—2220-Vol.1)
ENVIRONMENT
Pollution Abatement
Environmental Issues Briefing Book sections concerning water quality and solid waste regulatory issues impacting DOE plans and programs, 7:32080 (DOE/EV/10025—T1)
Radiation Monitoring
Design and environmental applications of an ultra-low-background, high-efficiency intrinsic Ge gamma-ray spectrometer, 7:32200 (PNL-SA—8945)
ENVIRONMENTAL EXPOSURE CHAMBERS
See EXPOSURE CHAMBERS
ENVIRONMENTAL MATERIALS
Mutagen Screening
History of attempts to quantify environmental mutagenesis, 7:32586 (BNL—30356)
ENZYMATIC HYDROLYSIS
Reviews
Enzymatic hydrolysis of cellulose: theory and applications, 7:31829 (LBL—13669)
EPITHERMAL REACTORS
Doppler Coefficient
DOPPLER program for calculating the Doppler temperature reactivity coefficient, 7:31964 (FEI—1097)
EPR
See ELECTRON SPIN RESONANCE
EPRI
See also ELECTRIC POWER
Research Programs
International cooperation in energy R & D, 7:32087
EQUATIONS (DIFFERENTIAL)
See DIFFERENTIAL EQUATIONS
EQUATIONS OF STATE
Correlation Functions
Alternative derivation of the free energy in the mean-spherical approximation, 7:32831 (IA—1364)
Universality of the bridge functions and a semi-empirical freezing criterion in 2 and 3 dimensions, 7:32830 (IA—1364)
Coupling
Universal strong coupling equations of state, 7:32832 (IA—1364)
EQUILIBRIUM PLASMA
Correlation Functions
Influence of the collisions of electrons and ions with atoms and molecules on the dynamic form-factors of bounded many-particle systems, 7:32871 (ITP—80-108-E)
EREVAN SYNCHROTRON
Coherent Radiation
Program controlled system for measuring and monitoring the electron coherent radiation spectrum of Yerevan synchrotron, 7:32370 (EFI—398(5)-80)
Plastic Scintillation Detectors
Program controlled system for measuring and monitoring the electron coherent radiation spectrum of Yerevan synchrotron, 7:32370 (EFI—398(5)-80)
ERYTHROCYTES
Cell Membranes
Antibody coated gold particles containing radioactive gold in the demonstration of cell surface molecules, 7:32543
ESR
See ELECTRON SPIN RESONANCE
ESTUARINE ECOSYSTEMS
See AQUATIC ECOSYSTEMS
ETHANE
Hydrogenation
Integrated approach to the systematic synthesis, characterization, and catalytic activity of novel heterogeneous catalysts. Final progress report, 7:32206 (DOE/ER/10381—3)
1,2-ETHANEDIOL
See GLYCOLS
ETHANOL
Adsorption
Photoelectron spectroscopy of methyl, ethyl and isopropyl alcohol adsorbed on the (110) surface of Cu, 7:32713
Biosynthesis
Enzymatic hydrolysis of cellulose: theory and applications, 7:31829 (LBL—13669)
Evaporation
Phase equilibrium properties of coal derived liquids. Technical progress report, July-December 1981, 7:31725 (DOE/PC/30230—23)
Meetings
Workshop on ethanol as an alternative source of fuels, 7:31845 (NP—2902045)
Phase Studies
Phase equilibrium properties of coal derived liquids. Technical progress report, July-December 1981, 7:31725 (DOE/PC/30230—23)
Photoelectron Spectroscopy
Photoelectron spectroscopy of methyl, ethyl and isopropyl alcohol adsorbed on the (110) surface of Cu, 7:32713
Solvent Properties
Macromolecular structural changes in bituminous coals during extraction and solubilization. Quarterly technical progress report, 1 September 1981-1 December 1981, 7:31724 (DOE/PC/30222—T2)
Water Removal
Alcohol fuels program technical review, 7:31840 (DOE/TIC—2006904)
ETHANOL PLANTS
Propsects for ethanol in Indonesia, 7:31846 (NP—2902045)
Design
Design for a small-scale fuel-alcohol plant, 7:31841 (EGG-M—04481)
ETHERS
Chemical Reactions
Thermal ion-molecule reactions in oxygen-containing molecules, 7:32216 (JAERI-M—9336)
ETHINE
See ACETYLENE
ETHYLENE
Hydrogenation
Integrated approach to the systematic synthesis, characterization, and catalytic activity of novel heterogeneous catalysts. Final progress report, 7:32206 (DOE/ER/10381—3)
ETHYLENE GLYCOL
See GLYCOLS
ETHYNE
See ACETYLENE
EUROPIUM
Complexometry
Effect of organic complexants on the mobility of low level waste radionuclides in soils, 7:31805 (PNL-SA—10019)
Sorption
Effect of organic complexants on the mobility of low level waste radionuclides in soils, 7:31805 (PNL-SA—10019)
EUROPIUM 152
Adsorption
Research and development related to the Nevada Nuclear Waste Storage Investigations. Progress report, April 1-June 30, 1981, 7:31795 (LA—8959-PR)

EVACUATED TUBE COLLECTORS
Compound Parabolic Concentrators
Engineering development studies for integrated evacuated CPC arrays. Interim technical progress report, 7:31876 (DOE/AL/16223—1)
Design
Engineering development studies for integrated evacuated CPC arrays. Interim technical progress report, 7:31876 (DOE/AL/16223—1)
Fabrication
Engineering development studies for integrated evacuated CPC arrays. Interim technical progress report, 7:31876 (DOE/AL/16223—1)
Performance Testing
Engineering development studies for integrated evacuated CPC arrays. Interim technical progress report, 7:31876 (DOE/AL/16223—1)
EVAPORATORS
Biological Fouling
OTEC biofouling, corrosion, and materials study from a moored platform at Punta Tuna, Puerto Rico, 7:31864 (ANL/OTEC-BCM—023)
Design
Hot air drum evaporator (Patent), 7:31813
EXHAUST GASES
Chemical Composition
Coupling of transport and chemical processes in catalytic combustion. Final report, 7:32305 (DOE/MC/14036—T1)
EXPERIMENTAL BREEDER REACTOR-2
See EBR-2 REACTOR
EXPLOSIVE FRACTURING
Bench-Scale Experiments
Fracture of Devonian shale by tailored pulse-loading. Final report, August 15, 1977-August 15, 1978, 7:31769 (DOE/ET/12074—T1)
Computer Codes
Fracture of Devonian shale by tailored pulse-loading. Final report, August 15, 1977-August 15, 1978, 7:31769 (DOE/ET/12074—T1)
EXPONENTIAL PILES
See SUBCRITICAL ASSEMBLIES
EXPOSURE CHAMBERS
Control Equipment
Environmental chamber low temperature cutoff. Final report, 7:32248 (BDX—613-2722)
Temperature Control
Environmental chamber low temperature cutoff. Final report, 7:32248 (BDX—613-2722)
EXTENSIVE AIR SHOWERS
Average properties and fluctuations of the lateral distribution of large air showers, 7:32623
Character of nuclear interactions and composition of primary cosmic rays at 10^{15}eV to 10^{20}eV deduced from air showers observed at 5200m and 900m above sea level, 7:32629
Cosmic ray air showers ($>10^{18}$ eV), 7:32615
Fluctuations of density flux and lateral distribution of EAS particles with $E_0 >= 10^{17}$eV, 7:32624
Size and density spectra of vertical and inclined showers at Akeno, 7:32627
Study of EAS development, 7:32658
Age Dependence
Core structure studied with the lattice air shower detectors at Mt. Chacaltaya, 7:32669
Study of the age parameter of extensive air showers observed at sea level, 7:32659
SYS air shower experiment at Mt. Chacaltaya, 7:32667
Cascade Showers
Cascade development of cosmic ray showers, 7:32628
Cherenkov Radiation
Atmospheric Cerenkov measurements of EAS, 7:32636
Atmospheric Cerenkov light from air showers above 10^{15} eV observed at 900m above sea level, 7:32640
Atmospheric Cerenkov light from large air showers observed at 5200m above sea level, 7:32641
Calculated time characteristics of Cerenkov pulses from air showers, 7:32655
Comparison of Cerenkov radiation pulse shapes calculated regarding and disregarding thickness and curvature of shower front, 7:32652
Computer simulations of atmosphere Cerenkov radiation in large cosmic ray showers, 7:32651
Cosmic ray showers imaged in Cerenkov light, 7:32650
Drift of depth of EAS maximum development with primary energy $10^{18} + 10^{19}$eV, 7:32644
Experimental data on the lateral distribution of Cerenkov radiation from EAS, 7:32638
Flux density fluctuations of the EAS atmospheric Cerenkov light with primary energy above 10^{17}eV, 7:32645
Lateral distribution of atmospheric Cerenkov light, 7:32639
Lateral distribution of Cerenkov light in cosmic ray showers, 7:32648
Measurements of the Cerenkov light pulse duration at the Samarkand State University EAS array, 7:32637
Monte Carlo calculation of Cerenkov light from the extensive air shower, 7:32654
Observation of Cerenkov light at the distance of more than 1Km from the EAS core, 7:32642
Observation of EAS Cerenkov light reflected from mountain snow, 7:32643
Separation of the charged particle and Cerenkov light components of large cosmic ray showers, 7:32647
Shape of Cerenkov light pulses as a measure of cascade development in large air showers, 7:32649
Shape of EAS cascade curve at $E_0 > 10^{17}$eV, 7:32646
Simplified method of calculation of Cerenkov pulse height distribution from EAS, 7:32653
Cosmic Photons
X-ray photons in extensive air showers, 7:32656
Cosmic Ray Detection
Measurement of the elongate rate from $2 \times 10^{17} - 10^{20}$eV, 7:32620
Spark chamber study of subcores at mountain altitude, 7:32670
Study of the air-shower response of current-limited spark chambers and scintillators, 7:32673
Electron Density
Measurements of electron densities in E.A.S. using spark chambers and thin scintillators, 7:32672
Electrons
Arrival time distribution of electron components near the air shower core at Akeno, 7:32665
Detailed examination of the electron lateral energy and density near the core of medium energy air showers, 7:32662
Drift of depth of EAS maximum development with primary energy $10^{18} + 10^{19}$eV, 7:32644
Fluctuations of the muon and electron lateral distributions in extensive air showers, 7:32660
Lateral distribution of electron-photon component in large cosmic ray showers, 7:32630
Lateral distributions of electrons and muons in EAS, 7:32631
Lateral electron distribution in EAS of different sizes, 7:32622
Muon densities and muon/electron ratios in EAS, 7:32616
Phenomenological characteristics of the muon and electron components of extensive air showers with sizes 10^8-10^7 at mountain altitude, 7:32661
Shape of EAS cascade curve at $E_0 > 10^{17}$eV, 7:32646
Simulations of the longitudinal development and lateral distribution of electrons in extensive air showers, 7:32675
Size dependence of various observables at Akeno, 7:32626
Energy
Energy flow of extensive air showers, 7:32677
Energy flow of air shower cores in Akeno, 7:32678
Energy Spectra
Air shower cores observed with emulsion chambers combined with the air shower array at Mt. Chacaltaya, 7:32668
Hadrons
Observation of hadronic components and muons in EAS at mountain altitude, 7:32663
Jets
Data on multicore air showers and cross-section of high-transverse momentum jets production at $\sqrt{S}$ approximately 500 GeV, 7:32676

Mathematical Models
Usage of small EAS with Nsub(e) approximately 10^4 at mountains for the calibration of the interaction model, 7:32657
Muons
Analysis of experimental data on EAS, 7:32614
Arrival time distribution of muons in large air showers observed at 900m above sea level, 7:32619
Comparison of muon rise-times and muon/electron density ratios with model calculations, 7:32621
Correlation of the high energy muons with the size of the air showers associated, 7:32685
Effect of the earth's magnetic field in the large zenith angle EAS of superhigh energies, 7:32633
Fluctuations of the muon and electron lateral distributions in extensive air showers, 7:32660
Lateral distribution of muon in EAS, 7:32612
Lateral distributions of electrons and muons in EAS, 7:32631
Multi-parameter measurements of shower structure above 10^{17}eV, 7:32625
Muon densities and muon/electron ratios in EAS, 7:32616
Muon size and muon fluctuation, 7:32613
Muon time spreads in EAS, 7:32618
Observation of hadronic components and muons in EAS at mountain altitude, 7:32663
Phenomenological characteristics of the muon and electron components of extensive air showers with sizes 10^5-10^7 at mountain altitude, 7:32661
Spatial characteristics of the muon component of large air showers, 7:32617
Time delay distribution of high energy muons in the EAS, 7:32666
Nucleon-Nucleon Interactions
Size dependence of the average transverse momentum of hadrons with respect to the shower axis direction in extensive air showers observed at sea level, 7:32671
Pressure Coefficient
Size spectra and anisotropy measurements with the Buckland Park array, 7:32664
Radiowave Radiation
Frequency spectrum of radio emission from air showers, 7:32635
Simulation
Analysis of giant air showers, 7:32632
Simulation of measurements at the Yakutsk complex EAS array, 7:32634
Temperature Coefficient
Size spectra and anisotropy measurements with the Buckland Park array, 7:32664

F

FACE CENTERED CUBIC
See FCC LATTICES
FACILITIES (ACCELERATOR)
See ACCELERATOR FACILITIES
FACILITIES (MILITARY)
See MILITARY FACILITIES
FACILITIES (NUCLEAR)
See NUCLEAR FACILITIES
FACILITIES (STORAGE)
See STORAGE FACILITIES
FACILITIES (TEST)
See TEST FACILITIES
FAILED ELEMENT DETECTION
Improvement of failed fuel detection system of light water reactor, 7:31925 (KAERI/RR—226/80)
FAST BREEDER BLANKET FACILITY (FBBF)
See SUBCRITICAL ASSEMBLIES
FAST BREEDER TYPE REACTORS
See FBR TYPE REACTORS
FAST FLUX TEST FACILITY REACTOR
See FFTF REACTOR
FAST-MIXED SPECTRUM REACTOR
See FBR TYPE REACTORS
FBR TYPE REACTORS
See also LMFBR TYPE REACTORS
Reactor Kinetics
DIAMANT 2: a multigroup neutron-transport program for triangular and hexagonal geometry, 7:31975 (ORNL-tr—4797)
FCC LATTICES
Lattice Parameters
Vacancy behavior in a compressed fcc Lennard-Jones crystal, 7:32835 (LA—9121-MS)
FEDAL
See FAILED ELEMENT DETECTION
FEDERAL REPUBLIC OF GERMANY
BWR Type Reactors
State of pressure suppression containment research in the Federal Republic of Germany, 7:32019 (GKSS—81/E/27)
Coal Mining
Black coal. Data and trends 1978/79, 7:31735 (NP—2901005)
Coal mining in the West German power industry 1979, 7:31736 (NP—2901051)
Coordinated Research Programs
Joint research promotion by Bund and Laender. Cooperation between Bund and Laender in the joint project of research promotion according to Article 91 b, GG, 7:32084 (NP—82901096)
Electric Power Industry
Statistics report '80, 7:32100 (NP—2901048)
Energy Consumption
Coal mining in the West German power industry 1979, 7:31736 (NP—2901051)
Data on the development of the West German power industry in 1979, 7:32103 (NP—2901052)
Growth of energy consumption and prices in the USA, FRG, France, and the UK, 1950-1979, 7:32110 (IIASA-WP—80-126)
Energy Policy
Progress report 1979/1980, 7:32073 (NP—2901047)
Gas Utilities
Annual report on the 54th year of business 1979, 7:31767 (NP—2901045)
Gross Domestic Product
Growth of energy consumption and prices in the USA, FRG, France, and the UK, 1950-1979, 7:32110 (IIASA-WP—80-126)
Industry
Progress report 1979/1980, 7:32073 (NP—2901047)
Legislation
Quality assurance through jurisdiction, 7:32286
Petroleum Industry
Business report 1979, 7:31748 (NP—2901046)
Public Utilities
Public supply utilities in 1976 and 1977 in figures, 7:32076 (NP—2901082)
Spent Fuel Storage
Interim storage requirements for spent LWR fuel elements for alternative scenarios of an increased use of nuclear energy in the Federal Republic of Germany, 7:31791 (KFK—3084)
FERMENTATION
See also BIOCONVERSION
Aerobic Conditions
Measurement of bubble size distributions in fermentation media using a photoelectric probe, 7:32464
FERMILAB ACCELERATOR
Magnetic Spectrometers
High-energy-physics program at Texas A and M University. Annual progress report, July 15-December 1, 1981, 7:32358 (DOE/ER/40039—1)
FERMIUM
Chemical Properties
Chemical properties of the heavier actinides and transactinides, 7:32237 (UCRL—85944)
Electronic Structure
Chemical properties of the heavier actinides and transactinides, 7:32237 (UCRL—85944)

FERRATES
See IRON OXIDES
FERRITE GARNETS
Electron Spin Resonance
Influence of nuclear tracks on ferromagnetic resonance linewidth of yttrium iron garnets, 7:32182 (GSI—81-2)
Neutron Diffraction
Study on inelastic scattering spectra of slow neutrons in yttrium-aluminium garnet crystals with rare earth additions, 7:32807 (FEI—1130)
FERRITES
Uses
Magnetic materials and devices for high temperatures, 7:32466 (SAND—82-0425)
FERRITIC STEELS
Corrosion
High-temperature corrosion of ferritc chromium steels and austenitic chromium-nickel steels in atmospheres containing hydrogen sulphide, 7:32157 (NP—2901084)
Fracture Properties
Investigation of the tensile deformation and fracture of a dual-phase steel, 7:32143 (DOE/ER/10556—86)
Microstructure
Investigation of the tensile deformation and fracture of a dual-phase steel, 7:32143 (DOE/ER/10556—86)
Tensile Properties
Investigation of the tensile deformation and fracture of a dual-phase steel, 7:32143 (DOE/ER/10556—86)
FERROMAGNETIC MATERIALS
Crystal Models
Conjecture on the critical frontier of the ferromagnetic Potts model on planar lattices, 7:32179 (CBPF-NF—029/80)
Magnetic Susceptibility
Conjecture on the critical frontier of the fully anisotropic homogeneous quenched bond-mixed potts ferromagnet in square lattice, 7:32178 (CBPF-NF—023/80)
FFTF REACTOR
Pipes
Low level vibration effects on snubber life, 7:32009
Seismic design of deadweight supports, 7:32062
Radioactive Wastes
Graphical and tabular summaries of decay characteristics for once-through PWR, LMFBR, and FFTF fuel cycle materials (Spent fuel, high-level waste fuel can scrap), 7:31956 (ORNL/TM—8061)
Reactor Safety
Operational safety at the FFTF, 7:32036
Reactor Start-Up
Structural considerations and findings from testing of nuclear components (symposium), 1981, 7:32010
Shock Absorbers
Low level vibration effects on snubber life, 7:32009
FIBROSIS
Radioinduction
Pathogenetic mechanism in lung fibrosis (Mice), 7:32585
FILMS
(Not for PHOTOGRAPHIC FILMS or NUCLEAR EMULSIONS.)
Technology Assessment
Thick film materials and discrete passive components, 7:32467 (SAND—82-0425)
Temperature Effects
Thick film materials and discrete passive components, 7:32467 (SAND—82-0425)
FILTERS
Electrostatics
Avoiding static charges in filter materials by using metal fibres, 7:32301
Fabrication
Production and application of molecular filters, 7:32249 (GSI—81-2)
Safety Engineering
Avoiding static charges in filter materials by using metal fibres, 7:32301
FINGERPRINTING (OIL SPILLS)
See OIL SPILLS
FIREDAMP
See METHANE
FIREWOOD
See WOOD FUELS
FIRST WALL
Cathode Sputtering
Physical problems of cathode sputtering. Reviews, 7:32890 (INIS-SU—33)
Erosion
Suppression of sputter-induced erosion rate from alkali covered metal surface, 7:32909
Failures
Failure criteria for fusion-reactor first-wall structural design, 7:32883 (DOE/ER/10107—10)
Materials Testing
Application of high-strength copper alloys for a fusion-reactor first wall, 7:32141 (DOE/ER/10107—9)
Meetings
Proceedings of the US/Japan workshop on divertors, first wall materials, and impurity control. Exchange Al in the US-Japan fusion cooperation program, 7:32894 (JAERI-M—8971)
Sputtering
Suppression of sputter-induced erosion rate from alkali covered metal surface, 7:32909
FISHES
See also TROUT
Entrainment
Impact of entrainment and impingement on fish populations in the Hudson River estuary. Volume I. Entrainment-impact estimates for six fish populations inhabiting the Hudson River estuary, 7:32526 (NUREG/CR—2220-Vol.1)
Population Dynamics
Impact of entrainment and impingement on fish populations in the Hudson River estuary. Volume I. Entrainment-impact estimates for six fish populations inhabiting the Hudson River estuary, 7:32526 (NUREG/CR—2220-Vol.1)
FISSION PRODUCTS
After-Heat
PROFP-Y: a computer code for producing nuclear data library of fission products, 7:32776 (JAERI-M—9714)
Buildup
PROFP-Y: a computer code for producing nuclear data library of fission products, 7:32776 (JAERI-M—9714)
Decay
PROFP-Y: a computer code for producing nuclear data library of fission products, 7:32776 (JAERI-M—9714)
Thermochromatography
Separation of reaction products by vacuum thermochromatography, 7:32190 (GSI—81-2)
FISSIONABLE MATERIALS MANAGEMENT
See NUCLEAR MATERIALS MANAGEMENT
FLOORS
Deformation
Report of investigation, first floor slab in ORNL building 9204-1, Y-12 plant, 7:32256 (Y/EN—611)
Dynamic Loads
Report of investigation, first floor slab in ORNL building 9204-1, Y-12 plant, 7:32256 (Y/EN—611)
Stress Analysis
Report of investigation, first floor slab in ORNL building 9204-1, Y-12 plant, 7:32256 (Y/EN—611)
FLORIDA
Severance Tax
Severance taxes on coal and uranium in the sunbelt, 7:31745
FLOW (FLUID)
See FLUID FLOW
FLUE GAS
Desulfurization
State-of-the-art of FGD sludge fixation. Final report, 7:31727 (EPRI-FP—671-Vol.3)
Nitrogen Oxides
Trade-offs in NO/sub x/ control, 7:32311
FLUID FLOW
See also LAMINAR FLOW
STEADY FLOW
SUBSONIC FLOW
TURBULENT FLOW
TWO-PHASE FLOW

UNSTEADY FLOW
Computerized Simulation
Variants of ICE-technique with reduction of numerical damping, 7:32720 (KFK—3170)
Finite Difference Method
Variants of ICE-technique with reduction of numerical damping, 7:32720 (KFK—3170)
Flow Rate
Velocity and temperature profiles in rough annuli, 7:32273 (KFK—3163)
Temperature Measurement
Velocity and temperature profiles in rough annuli, 7:32273 (KFK—3163)
FLUIDIZATION
Optimization studies of various coal-conversion systems. Quarterly report Nos. 1 and 2, May 1, 1981-July 13, 1981 and August 1, 1981-October 31, 1981, 7:31716 (DOE/PC/40778—T1)
FLUIDIZED BED
Heat Transfer
Heat transfer between particles and fluid in aerated beds, 7:32282
FLUIDIZED-BED COMBUSTION
Energy Demand
Oak Ridge Industrial Model: an introduction, 7:32091 (CONF-801152—3)
FLUORESCENT CONCENTRATORS
See LUMINESCENT CONCENTRATORS
FLUORINATED ALICYCLIC HYDROCARBONS
Scintillation Quenching
Contribution of electronically excited states to the radiation chemistry of organic systems. Progress report, September 1, 1980-November 30, 1981, 7:32221 (DOE/ER/00913—2)
FLUORINATED ALIPHATIC HYDROCARBONS
Scintillation Quenching
Contribution of electronically excited states to the radiation chemistry of organic systems. Progress report, September 1, 1980-November 30, 1981, 7:32221 (DOE/ER/00913—2)
FLUORINE
Ion-Atom Collisions
Reactions of ions with atomic and molecular free radicals. Progress report, May 1, 1981-April 30, 1982 (Summaries of research activities at the University of Minnesota), 7:32693 (DOE/ER/02640—13)
FLUORINE 18
Collective Model
Interacting sp-boson model with isospin: an unified description of giant multipole resonances and other collective motions, 7:32797 (IFUSP-P—240)
FLY ASH
Chemical Composition
Hydration reactions of C_3A contained in an unusual flyash, 7:31723 (DOE/CS/40222—2)
Hydration
Hydration reactions of C_3A contained in an unusual flyash, 7:31723 (DOE/CS/40222—2)
Mineralogy
Hydration reactions of C_3A contained in an unusual flyash, 7:31723 (DOE/CS/40222—2)
FLYWHEEL-POWERED VEHICLES
Environmental Effects
Impact of flywheel-energy-storage technology upon taxicab fleet operation in a large metropolitan city, 7:32130 (LA-UR—81-3071)
Institutional Factors
Impact of flywheel-energy-storage technology upon taxicab fleet operation in a large metropolitan city, 7:32130 (LA-UR—81-3071)
Life-Cycle Cost
Impact of flywheel-energy-storage technology upon taxicab fleet operation in a large metropolitan city, 7:32130 (LA-UR—81-3071)
FOILS
Fabrication
Equipment for producing, investigating and testing carbon foils with high hydrogen contents, 7:32180 (GSI—81-2)
FOOD
See also MILK
VEGETABLES
Contamination
Influence of technological steps on the heavy metal contamination in foodstuffs, 7:32502
Environmental Exposure Pathway
Exposure to heavy metals from foods, 7:32500
FOREST LITTER
Seasonal Variations
Statistical evaluation of litterfall data from a forest monitoring study, 7:32498 (PNL-SA—9014)
FOSSIL FUELS
See also COAL
NATURAL GAS
OIL SHALES
PEAT
SHALE OIL
SYNTHETIC FUELS
Research Programs
Institute in 1978, 7:32911 (NP—2901108)
FOSSIL-FUEL POWER PLANTS
See also ELECTRIC UTILITIES
Combustors
Theoretical studies on heterogeneous combustion. Progress report, March 1, 1981-December 15, 1981, 7:32246 (DOE/ER/04433—5)
Comparative Evaluations
Decision framework for technology choice. Volume 1. A case study of one utility's coal-nuclear choice, 7:32098 (EPRI-EA—2153-Vol.1)
Energy Demand
Status of coal supply contracts for new electric generating units, 7:31744 (FERC—0069)
Environmental Effects
Effects of atmospheric deposition of energy-related pollutants on water quality: a review and assessment, 7:32478 (ANL/AA—26)
Environmental Impacts
Environmental, legal and political constraints on power plant siting in the southwestern United States. Special Series 16, 7:31911 (NP—2902471)
Fuel Substitution
Economics of crop and forest biomass for energy, 7:31843 (NP—2901471)
Possibilities and limits of oil substitution, 7:32088 (NP—2901053)
Fuel Supplies
Status of coal supply contracts for new electric generating units, 7:31744 (FERC—0069)
Land Use
Environmental, legal and political constraints on power plant siting in the southwestern United States. Special Series 16, 7:31911 (NP—2902471)
Legal Aspects
Environmental, legal and political constraints on power plant siting in the southwestern United States. Special Series 16, 7:31911 (NP—2902471)
Mechanical Vibrations
Long-life fatigue of type 316 stainless steel of temperatures up to 593 C, 7:31986
Productivity
Guide for prioritizing power plant productivity improvement projects: modification and simplification of the DOE/MRI methodology, 7:31902 (ORNL/SUB—7435/1)
Guide for prioritizing power plant productivity improvement projects: handbook of availability improvement methodology, 7:31903 (ORNL/Sub—7435/2)
Radioactive Effluents
Statement of the Strahlenschutzkommission concerning a comparison between population exposures due to radioactive emissions from coal-fired and nuclear power plants, 7:32494
Reliability
Guide for prioritizing power plant productivity improvement projects: modification and simplification of the DOE/MRI methodology, 7:31902 (ORNL/SUB—7435/1)
Guide for prioritizing power plant productivity improvement projects: handbook of availability improvement methodology, 7:31903 (ORNL/Sub—7435/2)

Seismic Effects
Current topics in piping and pipe support design (symposium), 1981, 7:32061
Site Selection
Environmental, legal and political constraints on power plant siting in the southwestern United States. Special Series 16, 7:31911 (NP—2902471)
Socio-Economic Factors
Environmental, legal and political constraints on power plant siting in the southwestern United States. Special Series 16, 7:31911 (NP—2902471)

FOUR-BODY PROBLEM
Faddeev Equations
Scattering integral equations and four-nucleon problem. Integral equations for Weinberg quasiparticles, 7:32799 (ITEP—13(1981))
Fredholm Equation
Scattering integral equations and four-nucleon problem. Integral equations for Weinberg quasiparticles, 7:32799 (ITEP—13(1981))

FRACTURE MECHANICS
Meetings
Development of fracture mechanics and related techniques for evaluation of flaws detected during inservice inspection. Part 3, 7:31985 (KAERI/RR—221/80)

FRANCE
Energy Consumption
Growth of energy consumption and prices in the USA, FRG, France, and the UK, 1950-1979, 7:32110 (IIASA-WP—80-126)
Gross Domestic Product
Growth of energy consumption and prices in the USA, FRG, France, and the UK, 1950-1979, 7:32110 (IIASA-WP—80-126)
Nuclear Industry
French electromechanical industry in the nuclear sector, 7:31915 (FRNC-CONF—206)

FRANCKENSTEIN
See SCANNING MEASURING PROJECTORS

FREE CONVECTION
See NATURAL CONVECTION

FREE ELECTRON LASERS
Operation
Free electron laser employing an expanded hollow intense electron beam and periodic radial magnetic field, 7:32271

FRESH WATER ECOSYSTEMS
See AQUATIC ECOSYSTEMS

FRICKE DOSEMETERS
See CHEMICAL DOSEMETERS

FTR REACTOR
See FFTF REACTOR

FUEL ASSEMBLIES
See also FUEL ELEMENT CLUSTERS
Burnup
Combined iterative method for calculating the fuel burnup in nuclear reactors. Single-step kinetics, 7:31921 (ITEF—122(1980))
Fabrication
Establishing QC/QA system in the fabrication of nuclear fuel assemblies, 7:31994 (KAERI/RR—245/80)
Heat Transfer
Validation study of COBRA-WC for LMFBR steady-state and transient analysis, 7:31948 (PNL-SA—9441)
Hydraulics
Validation study of COBRA-WC for LMFBR steady-state and transient analysis, 7:31948 (PNL-SA—9441)
Neutron Spectra
Calculated neutron-source spectra from selected irradiated PWR fuel assemblies, 7:31928 (LA—9125-MS)
Quality Assurance
Establishing QC/QA system in the fabrication of nuclear fuel assemblies, 7:31994 (KAERI/RR—245/80)

FUEL BUNDLES
See FUEL ELEMENT CLUSTERS

FUEL CANS
Fabrication
Fabrication characteristics of Zircaloy tubes for nuclear reactors (Destructive testing, quality control), 7:31978 (CNEN-DIN—01/80)
Performance
Evaluation of the axial elongation of a can of a fuel rod in the RBMK-type reactor under the conditions of cyclic power variation, 7:31936 (FEI—1089)
Thermal Expansion
Evaluation of the axial elongation of a can of a fuel rod in the RBMK-type reactor under the conditions of cyclic power variation, 7:31936 (FEI—1089)

FUEL COOLING INSTALLATIONS
See SPENT FUEL STORAGE

FUEL CYCLE
See also FUEL MANAGEMENT
Coastdown in light water reactors as a fuel management strategy, 7:31920 (INIS-mf—6753)
Neutronic transmutation of transuranium isotopes in a fast neutron power reactor, 7:31944 (EUR—7008)
Economics
Assessment of nonbackfittable concepts for improving uranium utilization in LWRs, 7:31918 (PNL-SA—9100)
Environmental Effects
Effects of atmospheric deposition of energy-related pollutants on water quality: a review and assessment, 7:32478 (ANL/AA—26)

FUEL ELEMENT CLUSTERS
Fabrication
Fabrication of PWR fuel assembly and CANDU fuel bundle, 7:31926 (KAERI/RR—243/80)
Manufacturing of laboratory equipments, 7:31940 (KAERI/RR—238/80)
Hydrodynamics
Synthesis of porous vortex free bodies as a hydrodynamical design problem, 7:31991 (FEI—1095)
Mechanical Vibrations
Vibration of a group of circular cylinders subjected to fluid flow, 7:31990
Turbulent Flow
Steady-state, local temperature fields with turbulent sodium flow in nominal and disturbed bundle geometries with spacer grids, 7:31947 (KFK—2856)

FUEL ELEMENT FAILURE
Meetings
Research report on fuel failure in Mihama Unit 1 nuclear power plant, 7:31927 (KURRI-TR—197)

FUEL ELEMENTS
See also FUEL RODS
SPENT FUEL ELEMENTS
Nuclear design and analysis for PWR, 7:31923 (KAERI/RR—223/80)
Heat Transfer
Best estimate radiation heat transfer model developed for TRAN-BD1 (BWR), 7:32043
Radiant Heat Transfer
Radiative heat transfer to high pressure steam (BWR), 7:32044

FUEL INJECTION SYSTEMS
Design
Atomization characteristics of coal slurries. First quarterly report, September 1-November 30, 1981, 7:31739 (DOE/TIC—2006853)
Performance
Atomization characteristics of coal slurries. First quarterly report, September 1-November 30, 1981, 7:31739 (DOE/TIC—2006853)

FUEL MANAGEMENT
Nuclear design and analysis for PWR, 7:31923 (KAERI/RR—223/80)
Optimal Control
Coastdown in light water reactors as a fuel management strategy, 7:31920 (INIS-mf—6753)

FUEL OILS
See also HEATING OILS

Combustion
Saving fuel oil with fuel-blending and emulsifying systems, 7:32313
Emulsification
Saving fuel oil with fuel-blending and emulsifying systems, 7:32313
Mixtures
Saving fuel oil with fuel-blending and emulsifying systems, 7:32313
FUEL REPROCESSING PLANTS
See also HEF
Availability
Methods of availability planning for process structures with interim storage, 7:31790
Systems Analysis
Methods of availability planning for process structures with interim storage, 7:31790
FUEL RODS
See also HOLLOW FUEL RODS
Performance Testing
High burnup PWR ramp test program. First semi-annual progress report, October 1980-March 1981, 7:32014 (DOE/ET/34030—1)
US/FRG umbrella agreement for cooperation in GCR development. Fuel, fission products, and graphite subprogram. Quarterly status report, July 1, 1981-September 30, 1981, 7:31937 (GA-A—16558)
Transients
High burnup PWR ramp test program. First semi-annual progress report, October 1980-March 1981, 7:32014 (DOE/ET/34030—1)
FUEL SLURRIES
Atomization
Atomization characteristics of coal slurries. First quarterly report, September 1-November 30, 1981, 7:31739 (DOE/TIC—2006853)
Characteristics of coal/light hydrocarbon slurries in spray combustion. Quarterly progress report, September 1, 1981-November 30, 1981, 7:31740 (DOE/PC/30216—T3)
Combustion
Characteristics of coal/light hydrocarbon slurries in spray combustion. Quarterly progress report, September 1, 1981-November 30, 1981, 7:31740 (DOE/PC/30216—T3)
Energy Demand
Oak Ridge Industrial Model: an introduction, 7:32091 (CONF-801152—3)
FUEL-CLADDING INTERACTIONS
High burnup PWR ramp test program. First semi-annual progress report, October 1980-March 1981, 7:32014 (DOE/ET/34030—1)
FUELS
See also BOILER FUELS
DIESEL FUELS
FOSSIL FUELS
FUEL OILS
FUEL SLURRIES
HYDROGEN FUELS
LIQUID FUELS
SOLVENT-REFINED COAL
SYNTHETIC FUELS
THERMONUCLEAR FUELS
WOOD FUELS
Biodegradation
Microbiological contamination of fuels during storage, 7:31763
Contamination
Microbial contamination of ship fuels, 7:31762
Microbiological contamination of fuels during storage, 7:31763
Decomposition
Army needs for diesel fuel stability and cleanliness, 7:31761
Fuel Additives
Microbial contamination of ship fuels, 7:31762
Prices
Growth of energy consumption and prices in the USA, FRG, France, and the UK, 1950-1979, 7:32110 (IIASA-WP—80-126)
Price forecasting in DOE's short-term integrated forecasting system, 7:32077
Stability
Army needs for diesel fuel stability and cleanliness, 7:31761
Storage
Microbiological contamination of fuels during storage, 7:31763
FUELWOOD
See WOOD FUELS
FUMES
See AEROSOLS
FUNGI
See also TRICHODERMA
Control
Microbiological contamination of fuels during storage, 7:31763
Lyophilization
Microorganisms for fermentation of crop residues. Final technical report, 7:31839 (DOE/R5/10222—1)
FURNACES
Operation
Operating experience gained with slag tap furnaces, 7:32306
FUSION REACTORS
See THERMONUCLEAR REACTORS

G

GADOLINIUM
Electrochemistry
Electrochemical studies of trivalent californium and selected trivalent lanthanides in aqueous solutions, 7:32242
GAGES (STRAIN)
See STRAIN GAGES
GALLIUM ANTIMONIDES
Epitaxy
Liquid phase epitaxy techniques for compound semiconductor growth, 7:32185 (SAND—82-0025C)
GALLIUM ARSENIDES
Epitaxy
Liquid phase epitaxy techniques for compound semiconductor growth, 7:32185 (SAND—82-0025C)
GALLIUM PHOSPHIDES
Electric Contacts
Gallium phosphide devices, 7:31883 (SAND—82-0425)
Epitaxy
Liquid phase epitaxy techniques for compound semiconductor growth, 7:32185 (SAND—82-0025C)
GAME THEORY
Dynamic Programming
Games of protocol, 7:32931 (USC—113P19-78)
GAMMA CAMERAS
Performance
Focal plane camera for celestial XUV sources, 7:32397 (INIS-mf—6833)
Specifications
Focal plane camera for celestial XUV sources, 7:32397 (INIS-mf—6833)
GAMMA RADIOGRAPHY
Performance
Reminiscence of the beginning of the gammma-radiography, 7:32287
GAMMA SPECTRA
Coincidence Methods
"PROSPEC" computer program complex for automatic processing of multidimensional gamma-gamma coincidence spectra, 7:32403 (JINR—10-81-159)
GAMMA SPECTROMETERS
See also MOESSBAUER SPECTROMETERS
Accuracy
GAMS-200 hodoscope gamma spectrometer, 7:32392 (IFVE-OEF—80-141)
Design
Design and environmental applications of an ultra-low-background, high-efficiency intrinsic Ge gamma-ray spectrometer, 7:32200 (PNL-SA—8945)
Performance
GAMS-200 hodoscope gamma spectrometer, 7:32392 (IFVE-OEF—80-141)

GAMMA SPECTROSCOPY
NaI Detectors
Status of the NaI crystal ball project, 7:32382 (GSI—81-2)
GAS COMPRESSORS
Failure Mode Analysis
Methods to avoid inadmissibly high final compression temperatures, 7:32258
GAS COOLANTS
See GASES
GAS LASERS
See also CARBON DIOXIDE LASERS
HELIUM-NEON LASERS
Electric Discharges
Model for diffuse breakdown in high pressure gases with uniform electric fields strengths, 7:32270
Fluid Flow
Self-supporting laser diffuser flow energizer, 7:32268
Performance
Self-supporting laser diffuser flow energizer, 7:32268
XeCl avalanche discharge laser employing Ar as a diluent (Patent), 7:32265
GAS SPILLS
Forecasting
Assessment of synfuel spill cleanup options, 7:31730 (PNL-SA—9806)
GAS TURBINES
See also COAL-FIRED GAS TURBINES
Cooling
Critical heat flux in the channels of a closed-loop water-cooled turbine, 7:31905
Critical Heat Flux
Critical heat flux in the channels of a closed-loop water-cooled turbine, 7:31905
Nozzles
Mechanical, thermal and hydraulic design of a monometallic water-cooled gas turbine nozzle, 7:31906
GASES
See also AIR
COSMIC GASES
EXHAUST GASES
FLUE GAS
NATURAL GAS
RARE GASES
Breakdown
Model for diffuse breakdown in high pressure gases with uniform electric fields strengths, 7:32270
Underground Storage
Wet powder seal for gas containment (Patent), 7:31811
GEIGER-MUELLER COUNTERS
Fabrication
Development of portable survey meter, 7:32415 (KAERI/RR—218/80)
GENE RECOMBINATION
Genetic Effects
Transformation of Haemophilus influenzae by recombinant molecules, 7:32545
GENERATOR-COORDINATE METHOD
Study of the relationship between the semi-classical and the generator coordinate methods, 7:32804 (IFUSP-P—241)
GENERATORS (STEAM)
See STEAM GENERATORS
GEOLOGIC STRATA
Radiation Monitoring
In situ subterranean determination of actinides by high-resolution gamma-ray spectrometry, 7:31817 (PNL-SA—8992)
GEORGIA
Severance Tax
Severance taxes on coal and uranium in the sunbelt, 7:31745
GEOTHERMAL FLUIDS
Samplers
High pressure-high temperature borehole fluid sampler, 7:31889 (SAND—82-0425)
Simulation
Solvent extraction of methane from simulated geopressured-geothermal fluids: sub-pilot test results, 7:31896 (UCID—19291)
Solid Wastes
Identification of solid wastes in geothermal operations. Acurex draft final report 80-70/EE, 7:31895 (DOE/SF/10838—T1)
GEOTHERMAL POWER PLANTS
Binary-Fluid Systems
Analyses of mixed hydrocarbon binary thermodynamic cycles for moderate temperature geothermal resources, 7:31893 (CONF-810812—42)
GEOTHERMAL RESOURCES
Resource Potential
Geothermal Development Plan: Pima County, 7:31881 (DOE/RA/50076—T12)
GEOTHERMAL WELLS
Cables
Development of a metal sheath cable, 7:31888 (SAND—82-0425)
Chemical Logging
Chemical logging of geothermal wells (Patent), 7:31891
Well Logging Equipment
Commercial 200-275°C hybrids, 7:31885 (SAND—82-0425)
GERMAN FR ORGANIZATIONS
Research Programs
Annual report for 1979 of the Umweltbundesamt (Federal Environmental Agency), 7:32081 (NP—2901083)
GERMANIUM
Chemical Reactions
Germanide formation by thermal treatment of platinum films deposited on single-crystal Ge<100> substrates, 7:32426
GERMANY (FEDERAL REPUBLIC)
See FEDERAL REPUBLIC OF GERMANY
GERMICIDES
Microbiological contamination of fuels during storage, 7:31763
Evaluation
Microbial contamination of ship fuels (Mercaptopyridine, methylene bisthiocyanate, triazines, organoboron compounds), 7:31762
GIANT CELLS
See TUMOR CELLS
GIANT RESONANCE
Collective Model
Interacting sp-boson model with isospin: an unified description of giant multipole resonances and other collective motions, 7:32797 (IFUSP-P—240)
GLASS
Crystal Doping
Development of materials for a luminescent solar collector. Annual progress report, Septemer 1, 1979-December 31, 1980, 7:31877 (DOE/ER/04996—2)
Leaching
High-level waste immobilization program. Quarterly report, October-December 1979, 7:31800 (PNL-SA—8408)
Radiolysis
Rates, distances, and energy control of electron tunneling reactions in rigid media, 7:32227
GLAUBER'S SALT
See SODIUM SULFATES
GLUCOSE
Biosynthesis
Enzymatic hydrolysis of cellulose: theory and applications, 7:31829 (LBL—13669)
Metabolism
Assessment of regional glucose metabolism in aging brain and dementia with positron-emission tomography, 7:32540 (BNL—30551)
GLYCERIN
See GLYCEROL
GLYCEROL
Density
Study of droplet formation for preparation of spheres by internal gelation, 7:31799 (ORNL/MIT—337)
Surface Tension
Study of droplet formation for preparation of spheres by internal gelation, 7:31799 (ORNL/MIT—337)
Viscosity
Study of droplet formation for preparation of spheres by internal gelation, 7:31799 (ORNL/MIT—337)

GLYCIDES
See SACCHARIDES
GLYCOLS
Density
Study of droplet formation for preparation of spheres by internal gelation, 7:31799 (ORNL/MIT—337)
Surface Tension
Study of droplet formation for preparation of spheres by internal gelation, 7:31799 (ORNL/MIT—337)
Viscosity
Study of droplet formation for preparation of spheres by internal gelation, 7:31799 (ORNL/MIT—337)
GOLD
Activation Analysis
Methods of gold content determination in geological samples with the use of microtron resonance neutrons, 7:32196 (JINR—18-80-841)
Charged-Particle Transport
Stopping power measurements with the modified UNILAC TOF-system, 7:32808 (GSI—81-2)
Sputtering
Monte Carlo calculations of light-ion sputtering as a function of the incident angle, 7:32716
Target sputtering by multicharged heavy ion beams, 7:32711 (RI—120)
Surface Coating
Steam condensation on various gold surfaces, 7:32260
GOLD 187
Electron Capture Decay
Nuclear chemistry research and spectroscopy with radioactive sources. Seventeenth annual progress report, 7:32787 (DOE/ER/03346—T1)
GOLD COMPLEXES
Electronic Structure
Electronic structure and Moessbauer hyperfine interactions of Au (I) compounds, 7:32827 (CBPF-A—0022/80)
GRAPHITE
Chemical Radiation Effects
Release of H and He from TiC, stainless steel, and graphite by pulsed electron and furnace heating, 7:32906
Ion Implantation
Trapping, detrapping and replacement of KeV hydrogen implanted into graphite, 7:32908
Ion-Atom Collisions
Energy and angular distribution of low energy H^+ and D^+ backscattered from polycrystalline carbon, 7:32714
Sputtering
Deuterium plasma-material wall interactions. Final report, 1 May 1979-30 September 1981, 7:32886 (DOE/ET/52008—2)
GRAVITATIONAL COLLAPSE
Fluid Mechanics
Studies of the nuclear equation of state using numerical calculations of nuclear drops collisions, 7:32606 (UCRL—86964)
Neutrinos
Monte Carlo study of neutrino acceleration in supernova shocks, 7:32684
GREAT BRITAIN
See UNITED KINGDOM
GROSSWELZHEIM HDR REACTOR
See HDR REACTOR
GROUND WATER
Chemical Analysis
Solid phases limiting the concentration of dissolved constituents in basalt aquifers of the Columbia Plateau in eastern Washington, 7:32602 (PNL-SA—9848)
Contamination
Problem of the validity of a specific activity model for tritium, 7:32533 (INIS-mf—6902)
Radiation Monitoring
Environmental surveillance plan for the Department of Energy's Niagara Falls Storage Site (NFSS), Lewiston, New York, 7:31797 (NLCO—008EV)
Radionuclide ground-water monitoring program for the separations area, Hanford Site, Washington State, 7:32534 (RHO-SA—216)
Results of the separations area ground-water monitoring network for 1980, 7:31807 (RHO-LD—165)
Radionuclide Migration
Radionuclide transport and retardation in tuff, 7:32523
Radionuclide ground-water monitoring program for the separations area, Hanford Site, Washington State, 7:32534 (RHO-SA—216)
GROUND-WATER RESERVES
See AQUIFERS

H

HADRON REACTIONS
Cross Sections
Hadron-nucleus collisions. Pt. 1. Picture, description procedure, cross-sections, 7:32778 (JINR—E-1-81-154)
Inelastic Scattering
Hadron-nucleon inelastic collision mean free path in nuclear matter, 7:32777 (JINR—E-1-80-799)
Nuclear Models
Cascade-exciton model of nuclear reactions. Model formulation, 7:32800 (JINR-R—2-80-774)
HADRON-HADRON INTERACTIONS
Angular Distribution
Bimodality of angular distribution in hadron-nucleon interactions at 200 to 400 GeV, 7:32735
Deep Inelastic Scattering
Investigation of deep inelastic hadron hadron collisions using a transverse energy trigger with large acceptance, 7:32729 (SLAC—245)
Flavor Model
Heavy flavor production from photons and hadrons, 7:32745 (SLAC—245)
Inclusive Interactions
Critical evaluation of the single particle inclusive cross sections used for describing particle production in high energy cosmic ray interactions, 7:32751
Limiting Fragmentation
High energy hadron physics with the FNAL Hybrid bubble chamber system, 7:32742 (KEK—79-33)
HADRONS
Particle Production
Heavy flavor production from photons and hadrons, 7:32745 (SLAC—245)
Wave Functions
Quantum chromodynamics and hadronic interactions at short distances, 7:32756 (SLAC—245)
HAEMOPHILUS
Gene Recombination
Transformation of Haemophilus influenzae by recombinant molecules, 7:32545
HAFNIUM
Electric Conductivity
Electric conductivity of titanium, zirconium, hafnium and its alloys. Communication 1, 7:32147 (FEI—1149)
HAFNIUM 176
E1-Transitions
Probability of E1-transition taking into account anharmonicity for ^{176}Hf in neutron binding energy range, 7:32785 (JINR-R—4-81-243)
HAIR
PIXE Analysis
Analysis of trace elements in human hair by PIXE, 7:32203 (PUC-tn—24/80)
Correction factor for hair analysis by PIXE, 7:32201 (PUC-tn—14/79)
HALOGENATED ALIPHATIC HYDROCARBONS
See also CHLORINATED ALIPHATIC HYDROCARBONS
FLUORINATED ALIPHATIC HYDROCARBONS
IODINATED ALIPHATIC HYDROCARBONS
Photolysis
Studies in chemical reactivity. Progress report, November 30, 1980-1 December 1981, 7:32222 (DOE/ER/02026—41)

HANFORD ATOMIC PRODUCTS OPERATION
See HAPO
HANFORD RESERVATION
Geology
Radionuclide ground-water monitoring program for the separations area, Hanford Site, Washington State, 7:32534 (RHO-SA—216)
Ground Water
Results of the separations area ground-water monitoring network for 1980, 7:31807 (RHO-LD—165)
Hydrology
Radionuclide ground-water monitoring program for the separations area, Hanford Site, Washington State, 7:32534 (RHO-SA—216)
Radiation Monitoring
Radionuclide ground-water monitoring program for the separations area, Hanford Site, Washington State, 7:32534 (RHO-SA—216)
Radioactive Waste Disposal
Radionuclide ground-water monitoring program for the separations area, Hanford Site, Washington State, 7:32534 (RHO-SA—216)
HAPO
(Hanford Atomic Products Operation.)
Radiation Monitoring
Development of monitoring programs for ERDA owned radioactive low-level waste burial sites. Final report, 7:31816 (DOE/EV/03759—T1)
HARBORS
Water Pollution
Benthic biological conditions of Los Angeles-Long Beach Harbors, 7:32532
HARD COAL
See BLACK COAL
HDEHP
(Bis(2-ethylhexyl) phosphate.)
Solvent Properties
Crown ethers as size-selective synergists in solvent extraction systems: a new selectivity parameter, 7:32218
HDR REACTOR
Blowdown
Analysis of HDR blowdown experiment for fluid-structure interactions, 7:32055
Reactor Safety Experiments
Analysis of HDR blowdown experiment for fluid-structure interactions, 7:32055
HE-3 COUNTERS
Efficiency
Absolute efficiency of the cylindrical neutron He^3-counter cassette, 7:32373 (FEI—1112)
Sensitivity
Neutron detector for detecting rare events of spontaneous fission, 7:32411 (JINR-R—13-81-18)
Spontaneous Fission
Neutron detector for detecting rare events of spontaneous fission, 7:32411 (JINR-R—13-81-18)
HEALTH HAZARDS
Forecasting
Human birth weight patterns as an indicator of populations subject to environmental stress, 7:32570
Risk Assessment
Use of a demographic model for health risk assessment, 7:32590
HEALTH PHYSICS
See RADIATION PROTECTION
HEAT EXCHANGERS
See also HEAT PUMPS
Biological Fouling
Technical assessment of the prevention of micro-fouling on OTEC heat-transfer surfaces through the use of ultraviolet radiation, 7:31865 (DOE/ET/21002—T21)
Hydrodynamics
Synthesis of porous vortex free bodies as a hydrodynamical design problem, 7:31991 (FEI—1095)
Mechanical Vibrations
Flow-induced tube vibration tests of typical industrial heat exchanger configurations, 7:32257
Vibration of a group of circular cylinders subjected to fluid flow, 7:31990
Meetings
Heat exchanger reliability. Proceedings of a seminar, 7:31938 (INIS-mf—6612)
Reliability
Heat exchanger reliability. Proceedings of a seminar, 7:31938 (INIS-mf—6612)
HEAT PUMPS
Comparison of heat pump water heaters and solar domestic water heaters, 7:32116 (SERI/TP—254-1482)
Coefficient of Performance
Heat pump operating with a mixture of fluids. Final report, 7:32118 (PB—82-143611)
Working Fluids
Heat pump operating with a mixture of fluids. Final report, 7:32118 (PB—82-143611)
HEAT STORAGE
See also SENSIBLE HEAT STORAGE
Economic Analysis
1980 survey and evaluation of utility conservation, load management, and solar end-use projects. Volume 3: utility load management projects. Final report, 7:32099 (EPRI-EM—2193-Vol.3)
Technology Assessment
1980 survey and evaluation of utility conservation, load management, and solar end-use projects. Volume 3: utility load management projects. Final report, 7:32099 (EPRI-EM—2193-Vol.3)
HEAT TRANSFER
Measuring Methods
Heat transfer and pressure drop at single rods with three-dimensional roughnesses. Large scale tests, 7:32274 (KFK—3164)
Heat transfer and pressure drop at single pins with three-dimensional roughnesses, 7:32275 (KFK—3165)
HEAT TRANSMISSION
See HEAT TRANSFER
HEATERS
See also WATER HEATERS
Design
In-situ tuff water migration/heater experiment: hardware mechanical design definition, 7:31808 (SAND—81-1048)
HEATING OILS
Chemical Analysis
Fuel oil distributor's experience with contaminated No. 2 fuel oil, 7:31759
Contamination
Fuel oil distributor's experience with contaminated No. 2 fuel oil, 7:31759
Decomposition
Accelerated stability test techniques for middle distillate fuels, 7:31756
Correlation of long-term storage and accelerated stability tests, 7:31758
du Pont F21 149°C (300°F) accelerated stability test, 7:31757
Fuel Additives
Stabilization of No. 2 fuel oils with caustic treating and additives, 7:31764
Quality Control
Navy needs and experience with distillate fuel stability and cleanliness, 7:31760
Specifications
Navy needs and experience with distillate fuel stability and cleanliness, 7:31760
Stability
Accelerated stability test techniques for middle distillate fuels, 7:31756
Correlation of long-term storage and accelerated stability tests, 7:31758
Distillate-fuel stability and cleanliness, 7:31755
du Pont F21 149°C (300°F) accelerated stability test, 7:31757
Future distillate fuels: what, when, where, and how stable, 7:31828
Navy needs and experience with distillate fuel stability and cleanliness, 7:31760

Storage stability trends for distillate fuels: panel discussion, 7:31765
Stabilization
Stabilization of No. 2 fuel oils with caustic treating and additives, 7:31764
Storage
Accelerated stability test techniques for middle distillate fuels, 7:31756
Correlation of long-term storage and accelerated stability tests, 7:31758
du Pont F21 149°C (300°F) accelerated stability test, 7:31757
Stabilization of No. 2 fuel oils with caustic treating and additives, 7:31764
Storage stability trends for distillate fuels: panel discussion, 7:31765

HEATING SYSTEMS
See also SOLAR HEATING SYSTEMS
Comparative Evaluations
Cost comparison of several heating systems, 7:32117
Damage
Fuel oil distributor's experience with contaminated No. 2 fuel oil, 7:31759

HEAVY ION ACCELERATORS
See also UNILAC
300 kV accelerator, 7:32316 (GSI—81-2)
High current experiments in the Wideroee structure, 7:32319 (GSI—81-2)
HOBILAC - a high-current accelerator system, 7:32321 (GSI—81-2)
Lattice of the booster synchrotron SIS40, 7:32318 (GSI—81-2)
Proton model of a heavy-ion RFQ accelerator, 7:32320 (GSI—81-2)
SIS - an accelerator facility for relativistic heavy ions, 7:32317 (GSI—81-2)

HEAVY ION REACTIONS
See also CALCIUM 48 REACTIONS
OXYGEN 16 REACTIONS
Cluster Model
Generation and scaling behaviour of high-energy pions in relativistic heavy ion reactions, 7:32798 (INIS-mf—6798)
Fluid Mechanics
Studies of the nuclear equation of state using numerical calculations of nuclear drops collisions, 7:32606 (UCRL—86964)
Fusion Reactions
Efficiency of a heavy-ion fusion accelerator facility, 7:32362 (GSI—81-2)
Global Analysis
Global analysis of relativistic heavy-ion collisions, 7:32803
Nuclear Potential
Phenomenological optical potentials of heavy ions, 7:32775 (INS—398)

HEAVY IONS
Collisions
Target sputtering by multicharged heavy ion beams, 7:32711 (RI—120)

HEAVY LIQUID BUBBLE CHAMBERS
Image Processing
General organization of program generation system for film data processing, 7:32410 (JINR-R—10-81-316)
Program generation as a software maintenance in big program systems, 7:32409 (JINR-R—10-81-315)

HEAVY NUCLEI
See also ACTINIDE NUCLEI
Photonuclear Reactions
Interference effects in Moessbauer spectra of M1-transitions (^{98}Kr, ^{119}Sn, ^{129}I, ^{149}Sm, ^{151}Eu, ^{169}Tm, ^{183}W, ^{193}Ir, ^{197}Au), 7:32772 (IAE—3313/1)

HECTORITE
See MONTMORILLONITE

HEF
Remote Handling
Color coding of televised task elements in remote work: a literature review with practical recommendations for a fuel reprocessing facility, 7:31788 (ORAU—190)

HEISSDAMPFREAKTORANLAGE
See HDR REACTOR

HELIUM
Breakdown
Dielectric breakdown in liquid helium, 7:32721
Electron-Molecule Collisions
Cross sections for electron impact ionisation of metastable rare-gas excimers (He$_2$sup(*), Kr$_2$sup(*), Xe$_2$sup(*)), 7:32712
Photoionization
Photoionization of helium to He^+ (n = 2), 7:32694 (DOE/ER/02892—29)
Photon-Atom Collisions
Photoionization of atoms. Final report, April 1, 1976-March 30, 1981, 7:32695 (DOE/ER/02892—30)

HELIUM 3
Desorption
Release of H and He from TiC, stainless steel, and graphite by pulsed electron and furnace heating, 7:32906

HELIUM 3 REACTIONS
Fission
Duration of ^{238}U fission induced by ^{3}He, 7:32794 (JINR-R—15-80-762)

HELIUM 4
HELIUM I
See also HELIUM II
Energy Levels
Coupled-channels treatment of the positive-parity resonances in ^{4}He, 7:32767
Nuclear Structure
Study of the relationship between the semi-classical and the generator coordinate methods, 7:32804 (IFUSP-P—241)
Resonance
Coupled-channels treatment of the positive-parity resonances in ^{4}He, 7:32767

HELIUM I
Heat Transfer
Experimantal study on heat transfer in He-I and He-II for stationary thermal load, 7:32719 (JINR—8-80-536)

HELIUM II
Heat Transfer
Cooling of superconducting magnet with superfluid He, 7:32263
Experimantal study on heat transfer in He-I and He-II for stationary thermal load, 7:32719 (JINR—8-80-536)
Stability and fast heat removal with He-II cooling for pulsed superconductive magnets, 7:32262
Stabilization of large superconducting magnets in superfluid helium. Heat transfer aspects, 7:32264

HELIUM IONS
Collisions
Monte Carlo calculations of light-ion sputtering as a function of the incident angle, 7:32716

HELIUM-NEON LASERS
Operation
Simple method for single-frequency operation and stabilization of a He-Ne laser, 7:32267
Stabilization
Simple method for single-frequency operation and stabilization of a He-Ne laser, 7:32267

HEMOGLOBIN
Stereochemistry
Weak binding gases as modulators of hemoglobin function, 7:32567

HEMOPHILUS
See HAEMOPHILUS

HERBICIDES
Uses
Use of controlled release herbicides in waste burial sites, 7:31818 (PNL-SA—9503)

HFIR REACTOR
Reactor Operation
High flux isotope reactor. Quarterly report, April, May, and June 1981, 7:32012 (ORNL/TM—8169)
High flux isotope reactor. Quarterly report, January, February, and March 1981, 7:32011 (ORNL/TM—8147)

HIGH FLUX ISOTOPE REACTOR
See HFIR REACTOR

HIGH-BETA PLASMA
Electric Conductivity
Computer simulation on microinstabilities and anomalous resistivity near the magnetic neutral sheet, 7:32869 (IPPJ—487)
HIGH-FREQUENCY HEATING
See also ECR HEATING
ICR HEATING
Hybrid Resonance
Mechanism for ion heating by lower hybrid waves, 7:32860 (IPPJ—476)
HIGH-LEVEL RADIOACTIVE WASTES
Coatings
Review of multibarrier waste from development, 7:31803 (PNL-SA—9440)
Containers
High-level waste immobilization program. Quarterly report, October-December 1979, 7:31800 (PNL-SA—8408)
Volatility
Volatility of some potential high-level radioactive waste forms, 7:31815
HIGH-PURITY GE DETECTORS
Electric Contacts
Germanide formation by thermal treatment of platinum films deposited on single-crystal Ge<100> substrates, 7:32426
HIGH-TEMPERATURE GAS-COOLED REACTOR
See HTGR TYPE REACTORS
HISTONES
Configuration Interaction
Nucleic acid-protein interactions: conformational studies. Progress report, September 1, 1978-August 31, 1981, 7:32541 (DOE/EV/04962—3)
HODOSCOPES
Gamma Spectrometers
GAMS-200 hodoscope gamma spectrometer, 7:32392 (IFVE-OEF—80-141)
Shower Counters
Evaluation of shower parameters by the moments method in hodoscope calorimeters, 7:32393 (IFVE-OEF—81-45)
HOISTS
Control Systems
Recent developments in automatic hauling winches, 7:32310
HOLLOW FUEL RODS
Swelling
Algorithm and computer code for calculating the swelling of the fuel elements with a ceramic fuel, 7:31992 (IAE—3275/5)
HORMONES
See also THYROID HORMONES
Radioimmunoassay
Radioimmunoassay of insect juvenile hormones and of their diol derivatives, 7:32550
HOT EXPERIMENT FACILITY
See HEF
HOT PLASMA
Charged-Particle Transport
Classical transfer coefficients in a plasma with impurities, 7:32853 (IAE—3309/6)
Kink Instability
Theory of the M = 1 mode in high temperature plasmas, 7:32856 (IPP—6-201)
HOT WATER HEATERS
See WATER HEATERS
HOT WIRE ANEMOMETERS
Accuracy
Measurement of local velocity in water with hot wire anemometers, 7:32279
Calibration
Measurement of local velocity in water with hot wire anemometers, 7:32279
HTGR TYPE REACTORS
After-Heat Removal
Primary loop heat exchanger for HTGR plant residual heat removal and auxiliary cooling system, 7:32040
Coated Fuel Particles
US/FRG umbrella agreement for cooperation in GCR development. Fuel, fission products, and graphite subprogram. Quarterly status report, July 1, 1981-September 30, 1981, 7:31937 (GA-A—16558)
Fuel Rods
US/FRG umbrella agreement for cooperation in GCR development. Fuel, fission products, and graphite subprogram. Quarterly status report, July 1, 1981-September 30, 1981, 7:31937 (GA-A—16558)
Reactor Licensing
Safety/licensing assessment of the 1170-MW(t) HTGR process heat plant, 7:32018 (GA-A—16467)
Reactor Materials
US/FRG umbrella agreement for cooperation in GCR development. Fuel, fission products, and graphite subprogram. Quarterly status report, July 1, 1981-September 30, 1981, 7:31937 (GA-A—16558)
Reactor Safety
Safety/licensing assessment of the 1170-MW(t) HTGR process heat plant, 7:32018 (GA-A—16467)
RHR Systems
Primary loop heat exchanger for HTGR plant residual heat removal and auxiliary cooling system, 7:32040
Risk Assessment
Safety/licensing assessment of the 1170-MW(t) HTGR process heat plant, 7:32018 (GA-A—16467)
HUMAN CELLS
See ANIMAL CELLS
HUMAN POPULATIONS
Body Burden
Deposition and retention of plutonium in the United States general population, 7:32577
Radiation Doses
Simplified evacuation model for estimating mitigation of early population exposures, 7:32572 (PNL-SA—9133)
Statement of the Strahlenschutzkommission concerning a comparison between population exposures due to radioactive emissions from coal-fired and nuclear power plants, 7:32494
HYDRATES
Catalytic Effects
Hydrogenation of carbon monoxide over rhodium oxide surfaces (At 250 to 350°C and 6 atm), 7:31827
HYDROCARBON LOGGING
See WELL LOGGING
HYDRODYNAMICS
Synthesis of porous vortex free bodies as a hydrodynamical design problem, 7:31991 (FEI—1095)
HYDROGEN
Chemisorption
Transfer matrix treatment of atomic chemisorption on transition metal surface, 7:32159 (PUC-tn—07/80)
Differential Cross Sections
Collisional processes of interest in MFE plasma research. Annual report, October 1, 1980-September 30, 1981, 7:32696 (DOE/ET/53025—T10)
Diffusion
Mound Facility activities in chemical and physical research: January-June 1981, 7:31825 (MLM—2884)
Ion-Atom Collisions
Cross sections for charge transfer collisions involving hydrogen atoms, 7:32703 (IPPJ-AM—15)
Electron capture by highly stripped ions, 7:32689 (AERE-TP—876)
Ionization cross sections for ion-atom and ion-molecule collisions, 1. Ionization cross sections for H^+, H_2^+, H_3^+, He^+ and He^{++} incident on H, H_2 and He, 7:32704 (JAERI-M—9310)
Ion-Molecule Collisions
Ionization cross sections for ion-atom and ion-molecule collisions, 1. Ionization cross sections for H^+, H_2^+, H_3^+, He^+ and He^{++} incident on H, H_2 and He, 7:32704 (JAERI-M—9310)
Mixing
Systems analysis of hydrogen supplementation in natural gas pipelines, 7:31771 (BNL—30440)
Recycling
Hydrogen recycling from stainless steel, 7:32905

Transport
Systems analysis of hydrogen supplementation in natural gas pipelines, 7:31771 (BNL—30440)

HYDROGEN 2
See DEUTERIUM

HYDROGEN 3
See TRITIUM

HYDROGEN FUELS
Performance Testing
Alcohol fuels program technical review, 7:31840 (DOE/TIC—2006904)

HYDROGEN IONS
See also HYDROGEN IONS 1 MINUS
HYDROGEN IONS 1 PLUS
HYDROGEN IONS 2 PLUS
HYDROGEN IONS 3 PLUS
Collisions
Monte Carlo calculations of light-ion sputtering as a function of the incident angle, 7:32716
Differential Cross Sections
Collisional processes of interest in MFE plasma research. Annual report, October 1, 1980-September 30, 1981, 7:32696 (DOE/ET/53025—T10)

HYDROGEN IONS 1 MINUS
Mathematical Models
Model for H^-, D^- production by hydrogen backscattering form alkali and alkali/transition-metal surfaces (Marlowe Code), 7:32907
Production
Model for H^-, D^- production by hydrogen backscattering form alkali and alkali/transition-metal surfaces (Marlowe Code), 7:32907

HYDROGEN IONS 1 PLUS
Energy Spectra
Energy and angular distribution of low energy H^+ and D^+ backscattered from polycrystalline carbon, 7:32714
Ion-Atom Collisions
Cross sections for charge transfer collisions involving hydrogen atoms, 7:32703 (IPPJ-AM—15)
Electron capture by highly stripped ions, 7:32689 (AERE-TP—876)
Energy and angular distribution of low energy H^+ and D^+ backscattered from polycrystalline carbon, 7:32714
Ionization cross sections for ion-atom and ion-molecule collisions, 1. Ionization cross sections for H^+, H_2^+, H_3^+, He^+ and He^{++} incident on H, H_2 and He, 7:32704 (JAERI-M—9310)
Ion-Molecule Collisions
Ionization cross sections for ion-atom and ion-molecule collisions, 1. Ionization cross sections for H^+, H_2^+, H_3^+, He^+ and He^{++} incident on H, H_2 and He, 7:32704 (JAERI-M—9310)

HYDROGEN IONS 2 PLUS
Ion-Atom Collisions
Ionization cross sections for ion-atom and ion-molecule collisions, 1. Ionization cross sections for H^+, H_2^+, H_3^+, He^+ and He^{++} incident on H, H_2 and He, 7:32704 (JAERI-M—9310)
Reactions of ions with atomic and molecular free radicals. Progress report, May 1, 1981-April 30, 1982 (Summaries of research activities at the University of Minnesota), 7:32693 (DOE/ER/02640—13)
Ion-Molecule Collisions
Ionization cross sections for ion-atom and ion-molecule collisions, 1. Ionization cross sections for H^+, H_2^+, H_3^+, He^+ and He^{++} incident on H, H_2 and He, 7:32704 (JAERI-M—9310)

HYDROGEN IONS 3 PLUS
Ion-Atom Collisions
Ionization cross sections for ion-atom and ion-molecule collisions, 1. Ionization cross sections for H^+, H_2^+, H_3^+, He^+ and He^{++} incident on H, H_2 and He, 7:32704 (JAERI-M—9310)
Ion-Molecule Collisions
Ionization cross sections for ion-atom and ion-molecule collisions, 1. Ionization cross sections for H^+, H_2^+, H_3^+, He^+ and He^{++} incident on H, H_2 and He, 7:32704 (JAERI-M—9310)

HYDROGEN LOGS
See NEUTRON-NEUTRON LOGGING

HYDROGEN SULFIDES
Corrosive Effects
High-temperature corrosion of ferritc chromium steels and austenitic chromium-nickel steels in atmospheres containing hydrogen sulphide, 7:32157 (NP—2901084)
Detection
Drilling and operating oil, gas, and geothermal wells in an H_2S environment, 7:31892 (NP—2902054)
Toxicity
Drilling and operating oil, gas, and geothermal wells in an H_2S environment, 7:31892 (NP—2902054)

HYDROGENATION
Catalysis
Hydrogenolysis of carbon and its catalysis by platinum, 7:31722
Catalysts
Integrated approach to the systematic synthesis, characterization, and catalytic activity of novel heterogeneous catalysts. Final progress report, 7:32206 (DOE/ER/10381—3)

HYDROLOGY
Mathematical Models
Numerical prediction of subsidence with coupled geomechanical-hydrological modeling, 7:32594 (LA-UR—81-3700)

HYPERTHYROIDISM
Diagnosis
Determination of endogenous labelling of thyroid hormones during a radioiodide test in euthyroid goiter patients and hyperthyroid patients, 7:32561

I

IBR-2 REACTOR
Magnetometers
Magnetic field stabilization within the 1-10 mkT range by means of cesium quantum magnetometer, 7:32002 (JINR-R—13-12037)
Neutron Spectrometers
Measuring module of spectrometer of neutron small angle scattering on the IBR pulse reactor, 7:32001 (JINR-R—10-80-826)

IBR-30 REACTOR
Neutron Detectors
International comparison of means for measurement of neutron spectra and radiation doses in the IBR-30 reactor beam, 7:32003 (JINR-R—16-80-448)
Neutron Spectra
International comparison of means for measurement of neutron spectra and radiation doses in the IBR-30 reactor beam, 7:32003 (JINR-R—16-80-448)

ICR HEATING
Comparative study of fundamental and second-harmonic ICRF wave propagation and damping at high density in the Alcator tokamak, 7:32848 (DOE/ET/51013—27)

IDAHO NATIONAL ENGINEERING LABORATORY
Radiation Monitoring
Development of monitoring programs for ERDA owned radioactive low-level waste burial sites. Final report, 7:31816 (DOE/EV/03759—T1)

ILLINOIS
Coal Gasification Plants
Illinois synthetic-fuels facilities-siting survey. Document No. 81/36, 7:32524 (NP—2903328)

ILLITE
Sorptive Properties
Adsorption of technetium on selected inorganic ion-exchange materials and on a range of naturally occurring minerals under oxic conditions, 7:32244

ILMENITE
Radioactivity
Natural radioactivity in the production of titanium dioxide pigment: a study of the Laporte Plant and environment behaviour of radionuclides at Bunbury, Western Australia, 7:32504 (ARL/TR—037)

IMINES
Electron Spin Resonance
Electron paramagnetic resonance and crystal structure study of bis(triphenylphosphine)iminium hexafluorouranate(V), 7:32239
Lattice Parameters
Electron paramagnetic resonance and crystal structure study of bis(triphenylphosphine)iminium hexafluorouranate(V), 7:32239

IMMOBILIZED ENZYMES
Enzyme Activity
Preparation and characterization of β-D-glucosidase immobilized in calcium alginate, 7:31848 (ORNL/MIT—336)

IMPACT SHOCK
Wave Propagation
Axisymmetric solutions in elastostatics and elastic wave propagation by ascent methods, 7:32847 (SAND—81-1729C)

INCINERATORS
Air Pollution Control
Apparatus for measuring chloride emissions from refuse incineration, 7:32465
Design
Mound cyclone incinerator. Volume I. Description and performance, 7:31796 (MLM-MU—81-72-0003-Vol.1)
Emission
Apparatus for measuring chloride emissions from refuse incineration, 7:32465

IN-CORE FUEL MANAGEMENT
See FUEL MANAGEMENT

INDIUM PHOSPHIDES
Epitaxy
Liquid phase epitaxy techniques for compound semiconductor growth, 7:32185 (SAND—82-0025C)

INDONESIA
Energy Consumption
Economics of ethanol in Indonesia, 7:31847 (NP—2902045)
Energy Demand
Propsects for ethanol in Indonesia, 7:31846 (NP—2902045)
Energy Supplies
Propsects for ethanol in Indonesia, 7:31846 (NP—2902045)

INDUSTRIAL PLANTS
See also CHEMICAL PLANTS
COAL GASIFICATION PLANTS
COAL LIQUEFACTION PLANTS
COAL PREPARATION PLANTS
ETHANOL PLANTS
ISOTOPE SEPARATION PLANTS
Boilers
Saving fuel oil with fuel-blending and emulsifying systems, 7:32313
Electric Power
Growth of energy consumption and prices in the USA, FRG, France, and the UK, 1950-1979, 7:32110 (IIASA-WP—80-126)
Energy Conservation
Saving fuel oil with fuel-blending and emulsifying systems, 7:32313
Fuels
Growth of energy consumption and prices in the USA, FRG, France, and the UK, 1950-1979, 7:32110 (IIASA-WP—80-126)
Heat Exchangers
Flow-induced tube vibration tests of typical industrial heat exchanger configurations, 7:32257

INDUSTRIAL RADIOGRAPHY
See also GAMMA RADIOGRAPHY
Ultrasonic Testing
Development of nondestructive testing technique. Ultrasonic testing and radiographic testing, 7:32453 (KAERI/RR—262/80)

INDUSTRIAL WASTES
Ground Disposal
Management of soil systems for the disposal of industrial wastes, 7:32497 (DP-MS—81-72)

INFORMATION SYSTEMS
Standardized Terminology
Energy Data Base: Subject Thesaurus Permutated Listing, 7:32933 (DOE/TIC—7000-R5(App.))

INHALATION EXPOSURE CHAMBERS
See EXPOSURE CHAMBERS

IN-SERVICE INSPECTION
Recent experience in inservice examinations (PWR type reactor.), 7:31930
Summary of ASME Section XI pump and valve testing program for nuclear power plants and an assessment of its effect on plant availability, 7:32059
Meetings
Development of fracture mechanics and related techniques for evaluation of flaws detected during inservice inspection. Part 3, 7:31985 (KAERI/RR—221/80)

IN-SITU GASIFICATION
Field Tests
WIDCO mine coal face in-situ gasification test, 7:31720 (UCID—19280)
Mass Balance
Mass balance results for the Pricetown I underground coal gasification field test, 7:31718 (MLM-MU—81-72-0002)
Planning
WIDCO mine coal face in-situ gasification test, 7:31720 (UCID—19280)

IN-SITU RETORTING
Water Treatment
Evaporation of in-situ oil-shale-retort water, 7:31776 (PNL-SA—9805)

INSTRUMENTS (MEASURING)
See MEASURING INSTRUMENTS

INTERACTIVE DISPLAY DEVICES
SING-dialoque subsystem for graphical representation of one-dimensional array contents, 7:32917 (JINR-R—11-12133)

INTERCONNECTED POWER SYSTEMS
Photovoltaic Power Supplies
Photovoltaics and electric utilities, 7:31834 (SAND—81-7027)
Technology Utilization
Integrating new sources into utility systems, 7:32102

INTERMEDIATE MASS NUCLEI
Photonuclear Reactions
Interference effects in Moessbauer spectra of M1-transitions (^{83}Kr, ^{119}Sn, ^{129}I, ^{149}Sm, ^{151}Eu, ^{169}Tm, ^{183}W, ^{193}Ir, ^{197}Au), 7:32772 (IAE—3313/1)

INTERSECTING BEAMS
See COLLIDING BEAMS

INTERSTELLAR SPACE
Chemical Reactions
Synthesis of life related molecules in interstellar space, 7:32687

INTOR TOKAMAK
Plasma Macroinstabilities
Computational studies of tokamak plasmas, 7:32873 (JAERI-M—9354)

INVARIANT IMBEDDING
Invariant imbedding, method of characteristics, and parameter estimation, 7:32932 (USC—113P-66)

IODINATED ALIPHATIC HYDROCARBONS
Photolysis
Studies in chemical reactivity. Progress report, November 30, 1980-1 December 1981, 7:32222 (DOE/ER/02026—41)

IODINE 129
Deposition
Iodine transfer from the ground into plants, 7:32509 (INIS-mf—6902)
Radioecological Concentration
I129 in the biocycle, 7:32510 (INIS-mf—6902)
Radionuclide Migration
I129 in the biocycle, 7:32510 (INIS-mf—6902)

IODINE 131
Adsorption
Research and development related to the Nevada Nuclear Waste Storage Investigations. Progress report, April 1-June 30, 1981, 7:31795 (LA—8959-PR)
IODINE ISOTOPES
Radionuclide Migration
Transfer from vegetation to milk, 7:32518 (INIS-mf—6902)
ION ACOUSTIC WAVES
Wave Propagation
Oblique collision of plane ion-acoustic solitons, 7:32859 (IPPJ—475)
ION COLLISIONS
See also ION-ATOM COLLISIONS
Backscattering
Model for H^-, D^- production by hydrogen backscattering form alkali and alkali/transition-metal surfaces (Marlowe Code), 7:32907
ION CYCLOTRON-RESONANCE HEATING
See ICR HEATING
ION IMPLANTATION
Distribution
Statistical sputtering contribution to resolution in concentration-depth profiles, 7:32291
ION MICROPROBE ANALYSIS
Heavy ion microprobe - a status report, 7:32386 (GSI—81-2)
ION SOURCES
ATOS-the installation for atom collision investigation, 7:32765 (IAE—3363/7)
Generation of tubular beams of negative hydrogen ions by a surface plasma source, 7:32899 (NIIEFA-P-K—0488)
Beam Extraction
Computer aided extractor design for the RIG 10 high intensity ion source, 7:32328 (GKSS—80/E/33)
Dissociation Energy
Prospects of ion hydride application in negative hydrogen ion sources, 7:32898 (NIIEFA-P-K—0470)
Electron Cyclotron-Resonance
Ion source development - ECR test source, 7:32344 (GSI—81-2)
Milli Amp Beam Currents
High current ion sources development, 7:32345 (GSI—81-2)
ION-ATOM COLLISIONS
Ionization
Application of a position sensitive proportional counter for an X-ray transmission spectrometer, 7:32380 (GSI—81-2)
IONIZATION CALORIMETERS
See SHOWER COUNTERS
IRIDIUM
Foam Separation
Concentration of trace elements from Cheleken peninsula thermal brines by means of foam flotation, 7:32195 (JINR—6-81-75)
IRIDIUM COMPLEXES
Catalytic Effects
Integrated approach to the systematic synthesis, characterization, and catalytic activity of novel heterogeneous catalysts. Final progress report, 7:32206 (DOE/ER/10381—3)
IRIDIUM HYDRIDES
Structural Chemical Analysis
Order-disorder transition in Sr_2IrD_5: evidence for square pyramidal IrD_5 units from powder neutron diffraction data, 7:32176
IRON
Catalytic Effects
Carbon number distribution of Fischer-Tropsch products formed on an iron catalyst in a slurry reactor, 7:31826
Corrosion
Corrosion of ion bombarded metals studied by neutron activation analysis, 7:32148 (GSI—81-2)
Electronic Structure
Electronic structure and Moessbauer isomer shift of the iron atom isolated in crystalline argon matrix, 7:32690 (CBPF-A—0004/80)
Hyperfine Structure
Study of hyperfine magnetic fields on the impurity of Sm in Fe and Ni ferromagnetic lattices, 7:32154 (JINR-R—14-81-177)
Leaching
Trace element characterization of coal wastes. Fifth annual progress report, October 1, 1979-September 30, 1980, 7:31728 (LA—8826-PR)
Magnetic Fields
Study of hyperfine magnetic fields on the impurity of Sm in Fe and Ni ferromagnetic lattices, 7:32154 (JINR-R—14-81-177)
Physical Radiation Effects
Corrosion of ion bombarded metals studied by neutron activation analysis, 7:32148 (GSI—81-2)
Proton Reactions
Study on the neutron yield from thick targets under the action of 645 MeV protons, 7:32766 (JINR—18-80-540)
Recycling
Reducing energy cost in the Scrap Iron and Steel Industry, 7:32121 (DOE/CS/20295—1)
IRON 59
Biological Availability
Transfer of the corrosion nuclides ^{59}Fe, ^{54}Mn, ^{65}Zn, and ^{60}Co from ground to vegetation, 7:32514 (INIS-mf—6902)
Radionuclide Migration
Transfer from vegetation to meat, 7:32519 (INIS-mf—6902)
Transfer of the corrosion nuclides ^{59}Fe, ^{54}Mn, ^{65}Zn, and ^{60}Co from ground to vegetation, 7:32514 (INIS-mf—6902)
IRON BASE ALLOYS
See also KOVAR
STEELS
Solubility
Investigation into carbon diffusion in multicomponent iron alloys with chromium, nickel, molybdenum and niobium in the range of γ-solid solutions, 7:32145 (FEI—1113)
IRON COMPLEXES
Catalytic Effects
Integrated approach to the systematic synthesis, characterization, and catalytic activity of novel heterogeneous catalysts. Final progress report, 7:32206 (DOE/ER/10381—3)
IRON OXIDES
See also ILMENITE
Crystal-Phase Transformations
Study of the maguemite-hematite transformation by magnetic resonance, 7:32183 (INIS-mf—6726)
ISING MODEL
Magnetic Fields
Ising model with competing axial interactions in the presence of a field, 7:32834 (IFUSP-P—239)
ISONITRILES
Reduction
Reduction of carbon monoxide. Past research summary, 7:32215 (DOE/ER/04949—1)
ISOTOPE ENRICHED MATERIALS
Fabrication
Production of thin targets of high isotopic enrichment with an electromagnetic separator, 7:32346 (GSI—81-2)
ISOTOPE SEPARATION PLANTS
On-Line Control Systems
Status report on the HELIOS system, 7:31824 (GSI—81-2)
ISX TOKAMAK
Tearing Instability
Finite-beta effects on the nonlinear evolution of the (m = 1;n = 1) mode in tokamaks, 7:32875 (ORNL/TM—8063)

J

JAPAN INST PLASMA PHYS STELLAR
See JIPP STELLARATOR
JIPP STELLARATOR
Plasma Density
Numerical simulation of density evolution in JIPP T-2 tokamak, 7:32865 (IPPJ—483)

JT-60 REACTORS
Containers
Detailed analysis of the dynamic behavior of the JT-60 vacuum vessel under the saddle-like electromagnetic forces, 7:32896 (JAERI-M—9242)
Cryopumps
Experiment of long pulse beam injection into cryopump, 7:32895 (JAERI-M—9213)

K

KAHL-MAIN REACTOR
See HDR REACTOR
KANSAI-1 REACTOR
See MIHAMA-1 REACTOR
KANSAS
Salt Deposits
Analysis of creep data for various natural rock salts, 7:32184 (SAND—81-2567)
KAOLINITE
Sorptive Properties
Adsorption of technetium on selected inorganic ion-exchange materials and on a range of naturally occurring minerals under oxic conditions, 7:32244
KEK SYNCHROTRON
Proton-Proton Interactions
Present experiments at KEK 12 GeV PS, 7:32726 (KEK—79-33)
Research Programs
Present experiments at KEK 12 GeV PS, 7:32726 (KEK—79-33)
KENTUCKY
Severance Tax
Severance taxes on coal and uranium in the sunbelt, 7:31745
KEROGEN
Extraction
Conversion of kerogen of Eastern US oil shale by tetralin and hydrogen, 7:31773 (CONF-820217—5)
KETENES
Photolysis
Studies in chemical reactivity. Progress report, November 30, 1980-1 December 1981, 7:32222 (DOE/ER/02026—41)
KETONES
See also ACETONE
Chemical Reactions
Thermal ion-molecule reactions in oxygen-containing molecules, 7:32216 (JAERI-M—9336)
KICKSORTERS
See PULSE ANALYZERS
KINASES (PHOSPHOTRANSFERASES)
See PHOSPHOTRANSFERASES
KINK INSTABILITY
Nonlinear Problems
Theory of the M = 1 mode in high temperature plasmas, 7:32856 (IPP—6-201)
KNOCK-ON ELECTRONS
See ELECTRONS
KORI-1 REACTOR
Fuel Management
Core management and performance analysis for PWR, 7:31924 (KAERI/RR—225/80)
Pressure Vessels
Experiments and analysis of thermal stresses around the nozzle of the reactor vessel, 7:31922 (KAERI/RR—222/80)
Reactor Cores
Core management and performance analysis for PWR, 7:31924 (KAERI/RR—225/80)
KOVAR
Fabrication
Tearing during pinch-off of Rolamite fill tubes, 7:32160 (SAND—81-1952)
Fracture Properties
Tearing during pinch-off of Rolamite fill tubes, 7:32160 (SAND—81-1952)
KRYPTON
Electron-Molecule Collisions
Cross sections for electron impact ionisation of metastable rare-gas excimers (He$_2$sup(*), Kr$_2$sup(*), Xe$_2$sup(*)), 7:32712
KRYPTON IONS
Stopping Power
Stopping power measurements with the modified UNILAC TOF-system, 7:32808 (GSI—81-2)

L

LABORATORY ANIMALS
Sensitivity
Biological monitoring of fluidized bed coal combustion operations. II. Mammalian responses following exposure to gaseous effluents, 7:32591
LAMBDA NEUTRAL
See LAMBDA PARTICLES
LAMBDA PARTICLES
Semileptonic Decay
Present experiments at KEK 12 GeV PS, 7:32726 (KEK—79-33)
LAMINAR FLOW
Mathematical Models
VNAP2: a computer program for computation of two-dimensional, time-dependent, compressible, turbulent flow, 7:32276 (LA—8872)
LAMPRE-1 REACTOR
Reactor Decommissioning
Decommissioning the Los Alamos Molten Plutonium Reactor Experiment (LAMPRE I), 7:31955 (LA—9052-MS)
LAND RECLAMATION
Revegetation
Guide for revegetating coal minesoils in the Eastern United States, 7:31729 (PB—81-245011)
LAND USE
Environmental Issues Briefing Book sections concerning water quality and solid waste regulatory issues impacting DOE plans and programs, 7:32080 (DOE/EV/10025—T1)
LANTHANUM
Lattice Parameters
Cobalt distribution in LaNi$_4$Co. A neutron diffraction study, 7:32209 (IA—1364)
Crystallographic structure of LaNisub(4)CoDsub(y). A neutron diffraction study, 7:32210 (IA—1364)
Self-Diffusion
Model of diffusion of metals. 2. Effect of polymorphic transformations on self-diffusion parameters, 7:32232 (FEI—1094)
LANTHANUM BORIDES
Corrosion Resistance
Composition for use in high-temperature hydrogen-fluorine environments and method for making the composition (Patent), 7:32175
Hydrofluoric Acid
Composition for use in high-temperature hydrogen-fluorine environments and method for making the composition (Patent), 7:32175
LAPLACE TRANSFORMATION
Accuracy
Application of an efficient algorithm for the numerical Laplace inversion, 7:32918 (Juel—1672)
Algorithms
Application of an efficient algorithm for the numerical Laplace inversion, 7:32918 (Juel—1672)
LASER FUSION REACTORS
Optical Systems
Coatings for laser fusion, 7:32903 (UCRL—87037)
LASER IMPLOSIONS
Turbulence
Anomalous viscosity due to weak turbulence in imploding target plasma, 7:32892 (IPPJ—473)

LASER ISOTOPE SEPARATION
Apparatus for the isotope separation, 7:31786 (KAERI/RR—256/80)
LASER RADIATION
Focusing
Self-calibrating technique for beam divergence measurements of CW and pulsed lasers, 7:32851 (IA—1364)
LASER SPECTROSCOPY
Generation of UV radiation utilizing the copper vapor laser lines, 7:32850 (IA—1364)
In-Beam Spectroscopy
In-beam laser fluorescence spectroscopy, 7:32385 (GSI—81-2)
LASER TARGETS
Coatings
Magnetron co-sputtering system for coating ICF targets, 7:31822 (UCRL—86160)
Equations of State
High energy laser facilities at Lawrence Livermore National Laboratory, 7:32904 (UCRL—87038)
LASER-PRODUCED PLASMA
Oscillations
Experimental investigation of linear mode conversion in laser-produced plasmas, 7:32876 (PLF—39)
LASERS
See also CARBON DIOXIDE LASERS
FREE ELECTRON LASERS
GAS LASERS
HELIUM-NEON LASERS
Gain
Optimization of the uv CuII Laser, 7:32269
Performance
Optimization of the uv CuII Laser, 7:32269
LASL
(Los Alamos Scientific Laboratory.)
Radiation Monitoring
Development of monitoring programs for ERDA owned radioactive low-level waste burial sites. Final report, 7:31816 (DOE/EV/03759—T1)
LATHES
Automation
Motion control system for the Large Optics Diamond Turning Machine (LODTM), 7:32254 (UCRL—86438)
Control Systems
Motion control system for the Large Optics Diamond Turning Machine (LODTM), 7:32254 (UCRL—86438)
Upgrading a production machine tool for precision machining, 7:32255 (Y—2264)
Performance
Upgrading a production machine tool for precision machining, 7:32255 (Y—2264)
LATTICE FIELD THEORY
Phase transitions and elementary-particle physics, 7:32752 (BNL—30432)
Monte Carlo Method
High-temperature expansion and Monte Carlo simulation of SU(5) gauge theory on a four-dimensional lattice: A comparison, 7:32760
LATTICES (CRYSTAL)
See CRYSTAL LATTICES
LATTICES (REACTOR)
See REACTOR LATTICES
LAWRENCE BERKELEY LABORATORY
Accelerator Facilities
User facilities at the Lawrence Berkeley Laboratory, 7:32354 (LBL-PUB—426)
LAWRENCE LIVERMORE LABORATORY
Computer Networks
EPROM-based LSI-11 for distributed instrumentation control, 7:32929 (UCRL—86500)
LAWRENCIUM
Chemical Properties
Chemical properties of the heavier actinides and transactinides, 7:32237 (UCRL—85944)
Electronic Structure
Chemical properties of the heavier actinides and transactinides, 7:32237 (UCRL—85944)
LEAD
Cascade Showers
Calculation of cascade curves for interactions of protons and nuclei of energy >= approximately 1 TeV/nucleon in lead, 7:32608
Cosmic Ray Propagation
Calculation of cascade curves for interactions of protons and nuclei of energy >= approximately 1 TeV/nucleon in lead, 7:32608
Ecological Concentration
Exposure to heavy metals from foods, 7:32500
Situation and analysis of residues in milk, 7:32499
Foam Separation
Concentration of trace elements from Cheleken peninsula thermal brines by means of foam flotation, 7:32195 (JINR—6-81-75)
Hadron Reactions
Hadron-nucleus collisions. Pt. 1. Picture, description procedure, cross-sections, 7:32778 (JINR—E-1-81-154)
Leaching
Trace element characterization of coal wastes. Fifth annual progress report, October 1, 1979-September 30, 1980, 7:31728 (LA—8826-PR)
Proton Reactions
Study on the neutron yield from thick targets under the action of 645 MeV protons, 7:32766 (JINR—18-80-540)
LEAD 202
Pairing Interactions
Equations of motion for nuclear particle-particle excitations and the interacting boson model, 7:32788 (IFUSP-P—245)
LEAD 204
Pairing Interactions
Equations of motion for nuclear particle-particle excitations and the interacting boson model, 7:32788 (IFUSP-P—245)
LEAD 206
Pairing Interactions
Equations of motion for nuclear particle-particle excitations and the interacting boson model, 7:32788 (IFUSP-P—245)
LEAD 207 TARGET
Hadron Reactions
Hadron-nucleon inelastic collision mean free path in nuclear matter, 7:32777 (JINR—E-1-80-799)
LEAD 208 TARGET
Calcium 48 Reactions
Study on the ^{48}Ca ion fusion with sup(203,205)Tl, sup(208)Pb and sup(209)Bi nuclei, 7:32790 (JINR-R—7-12061)
Charge-Exchange Reactions
Energy splitting between the $T=T_0$ and $T=T_0$-1 components of the charge-exchange vector dipole resonance, 7:32774 (IFUSP-P—246)
Neutron Reactions
E2 isovector giant resonance as seen through the capture of fast neutrons, 7:32795 (LA—9026)
Photonuclear Reactions
Elastic scattering of monochromatic photons at the atomic nucleus of ^{208}Pb in and above the dipole giant resonance, 7:32789 (INIS-mf—6825)
Proton Reactions
Strong sequential transfer processes in $O^+ \rightarrow O^+$ (p,t) reactions on Pb isotopes, 7:32791 (UTTAC—39)
LEAD 210
Radionuclide Migration
Ground/plant transfer factors of Ra-226, Po-210, and Pb-210, 7:32515 (INIS-mf—6902)
LEAD-ACID BATTERIES
Design
Application, sizing, testing and performance of the photovoltaic battery subsystem at Natural Bridges National Monument, Utah, 7:31855 (DOE/ET/20279—153)
Testing
Application, sizing, testing and performance of the photovoltaic battery subsystem at Natural Bridges National Monument, Utah, 7:31855 (DOE/ET/20279—153)
LEPTONS
See also ELECTRONS
MUONS
NEUTRINOS

Excited States
Research in theoretical physics. Annual progress report, April 1, 1981-March 31, 1982 (Preon models), 7:32738 (DOE/ER/03285—41)
Search for excited leptons in the next generation of experiments (Preons), 7:32722 (DOE/ER/03285—40)
Particle Structure
Composite quarks and leptons, 7:32759 (SLAC—245)

LEVEL INDICATORS
Liquid-level-sensing device (Patent), 7:32462
Performance Testing
Advanced two-phase instrumentation program. Quarterly progress report, July-September 1981 (PWR), 7:31929 (NUREG/CR—2204-Vol.3)

LIGHT NUCLEI
Collective Model
Interacting sp-boson model with isospin: an unified description of giant multipole resonances and other collective motions, 7:32797 (IFUSP-P—240)

LIGHTING SYSTEMS
Construction
Development and use of a hemispherical sky simulator, 7:32112 (LBL—13400)
Design
Development and use of a hemispherical sky simulator, 7:32112 (LBL—13400)

LIME-LIMESTONE WET SCRUBBING PROCESSES
Sludges
State-of-the-art of FGD sludge fixation. Final report, 7:31727 (EPRI-FP—671-Vol.3)

LINACS
See LINEAR ACCELERATORS

LINEAR ACCELERATORS
See also UNILAC
High current experiments in the Wideroee structure, 7:32319 (GSI—81-2)
HOBILAC - a high-current accelerator system, 7:32321 (GSI—81-2)
Beam Dynamics
Parmila-GSI - a computer program for beam dynamics in accelerators with space charge, 7:32324 (GSI—81-2)
Colliding Beams
Linear colliders: a preview, 7:32356 (SLAC—245)

LIQUID CRYSTALS
Moessbauer Effect
Moessbauer spectroscopy of thermotropic smectic liquid crystals: on the formation of complexes between label and liquid crystal molecules, 7:32842
Neutron Diffraction
Neutron critical scattering in PAA, 7:32840
Structure and dynamics of d-PAA neutron scattering, 7:32841
Nuclear Magnetic Resonance
Lyotropic mesophases studied by ^{31}P-NMR, 7:32843

LIQUID FUELS
Combustion
Theoretical studies on heterogeneous combustion. Progress report, March 1, 1981-December 15, 1981, 7:32246 (DOE/ER/04433—5)
Combustion Products
Soot volume fraction profiles in a free combusting boundary layer, 7:31766

LIQUID METAL FAST BREEDER REACTORS
See LMFBR TYPE REACTORS

LIQUID METAL TEST FACILITIES
See TEST FACILITIES

LIQUID SCINTILLATION DETECTORS
Development and calibration of NE 213 neutron detectors with pulse shape discrimination, 7:32388 (GSI—81-2)
Specifications
Light collection in large liquid scintillation counters with dacron foil wall, 7:32412 (JINR-R—13-81-74)

LITHIUM OXIDES
Gas Production Rates
Preliminary evaluation of beta-spodumene as a fusion reactor structural material, 7:32880 (CONF-810831—80)
Mechanical Properties
Preliminary evaluation of beta-spodumene as a fusion reactor structural material, 7:32880 (CONF-810831—80)
Physical Radiation Effects
Preliminary evaluation of beta-spodumene as a fusion reactor structural material, 7:32880 (CONF-810831—80)
Thermodynamic Properties
Preliminary evaluation of beta-spodumene as a fusion reactor structural material, 7:32880 (CONF-810831—80)

LIVER
Dynamic Function Studies
Arterial contribution to total liver perfusion, 7:32562
Functional study with ^{131}I-Rose Bengal in chronic active hepatitis and nonactive cirrhosis using a three-compartment model, 7:32555
Perfused Organs
Arterial contribution to total liver perfusion, 7:32562
Scintiscanning
Arterial contribution to total liver perfusion, 7:32562
Functional study with ^{131}I-Rose Bengal in chronic active hepatitis and nonactive cirrhosis using a three-compartment model, 7:32555
Visualization of the liver with sup(99m)Tc-EHDP in thalassemia major, 7:32552

LMFBR TYPE REACTORS
See also CLINCH RIVER BREEDER REACTOR
EBR-2 REACTOR
Design
LMFBR designs for the twenty-first century, 7:31952
Engineered Safety Systems
Direct reactor auxiliary cooling system for the 1000-MWE LMFBR developmental plant, 7:32037
Fuel Assemblies
Validation study of COBRA-WC for LMFBR steady-state and transient analysis, 7:31948 (PNL-SA—9441)
Fuel Cycle
Neutronic transmutation of transuranium isotopes in a fast neutron power reactor, 7:31944 (EUR—7008)
Oxygen Meters
Electrochemical cell for measuring oxygen activity in liquid sodium, 7:31945 (FEI—1061)
Pipes
Comparison of LMFBR piping response obtained using response spectra and time history methods, 7:32049
Experimental benchmark for piping system dynamic response analyses, 7:31953
Radioactive Wastes
Graphical and tabular summaries of decay characteristics for once-through PWR, LMFBR, and FFTF fuel cycle materials (Spent fuel, high-level waste fuel can scrap), 7:31956 (ORNL/TM—8061)
Reactor Components
Calculations of the reflection and transmission of ultrasound by rough sodium-filled defects in steel (LMFBR), 7:31942 (AERE-R—10095)
Reactor Cooling Systems
Direct reactor auxiliary cooling system for the 1000-MWE LMFBR developmental plant, 7:32037
Semianalytical method of nonstationary thermal problem solution for a pipeline with an incompressible coolant, 7:31946 (IAE—3288/5)
Reactor Materials
Thermal radiation properties of ThO/sub 2/ in contact with sodium and steel, 7:31996
Reactor Protection Systems
Development of a self-actuated shutdown system, 7:32038
Reactor Safety
Development of a self-actuated shutdown system, 7:32038
Reactor Shutdown
Development of a self-actuated shutdown system, 7:32038
Steam Generators
Data analysis and analytical predictions of a steam generator tube bundle flow field for verification of 2-D T/H computer code, 7:31949
Double-wall tube steam generator for breeder nuclear plants, 7:31950

LOAD MANAGEMENT
Economic Analysis
1980 survey and evaluation of utility conservation, load management, and solar end-use projects. Volume 3: utility load management projects. Final report, 7:32099 (EPRI-EM—2193-Vol.3)
Technology Assessment
1980 survey and evaluation of utility conservation, load management, and solar end-use projects. Volume 3: utility load management projects. Final report, 7:32099 (EPRI-EM—2193-Vol.3)
LOADING MACHINES (REACTOR)
See REACTOR CHARGING MACHINES
LOGIC CIRCUITS
Design
Universal high temperature CMOS logic, 7:32303 (SAND—82-0425)
MOS Transistors
Universal high temperature CMOS logic, 7:32303 (SAND—82-0425)
Temperature Effects
Universal high temperature CMOS logic, 7:32303 (SAND—82-0425)
LONGITUDINAL PINCH
Breakdown
Effect of metallic diaphragms on discharge evolution in a zet-pinch, 7:32878 (SFTI—10)
LONGWALL MINING
Information
Longwall data bank. Semiannual project report, May 28-November 28, 1981, 7:31733 (DOE/FE/00080—2)
Mining Equipment
Longwall data bank. Semiannual project report, May 28-November 28, 1981, 7:31733 (DOE/FE/00080—2)
Productivity
Longwall data bank. Semiannual project report, May 28-November 28, 1981, 7:31733 (DOE/FE/00080—2)
Shearer Loaders
Technical progress report No. 5, December 1-December 31, 1981, 7:31734 (FMA-BM—8148-81)
LOS ALAMOS MOLT. PLUT. REACTOR EXPERIMENT
See LAMPRE-1 REACTOR
LOS ANGELES
Harbors
Benthic biological conditions of Los Angeles-Long Beach Harbors, 7:32532
LOSS OF COOLANT
After-Heat Removal
Radiative heat transfer to high pressure steam (BWR), 7:32044
Data Processing
LFTPLT8: plotter program for RELAP5 code (PWR), 7:32029 (JAERI-M—9359)
Heat Transfer
Experimental study of safety injection and reflooding (PWR; BWR), 7:32032 (KAERI/RR—231/80)
Holographic investigation of nonequilibrium vapor generation in a two-dimensional nozzle (PWR; BWR), 7:32016 (EGG-M—02381)
Virtual mass calculation for loss-of-coolant-accident analysis of a pressurized water reactor, 7:32057
Hydraulics
Experimental study of safety injection and reflooding (PWR; BWR), 7:32032 (KAERI/RR—231/80)
Full-Scale Mark II CRT program data report No. 11 (TEST 1204) (BWR), 7:32031 (JAERI-M—9404)
Holographic investigation of nonequilibrium vapor generation in a two-dimensional nozzle (PWR; BWR), 7:32016 (EGG-M—02381)
Virtual mass calculation for loss-of-coolant-accident analysis of a pressurized water reactor, 7:32057
Hydrodynamics
Evaluation of incompressible hydrodynamic mass methods in reactor applications (PWR), 7:32056
Method for coupled three-dimensional analysis of reactor vessel blowdowns with internal structures (PWR), 7:32054
Pressure Gradients
Full-Scale Mark II CRT program data report No. 10 (TEST 1203) (BWR), 7:32030 (JAERI-M—9403)
Full-Scale Mark II CRT program data report No. 11 (TEST 1204) (BWR), 7:32031 (JAERI-M—9404)
Transient deformation properties of Zircaloy for LOCA simulation. Final report, 7:32017 (EPRI-NP—526-Vol.4,Pt.2)
Temperature Gradients
Transient deformation properties of Zircaloy for LOCA simulation. Final report, 7:32017 (EPRI-NP—526-Vol.4,Pt.2)
Thermodynamics
Full-Scale Mark II CRT program data report No. 10 (TEST 1203) (BWR), 7:32030 (JAERI-M—9403)
LOUISIANA
Salt Deposits
Analysis of creep data for various natural rock salts, 7:32184 (SAND—81-2567)
Severance Tax
Severance taxes on coal and uranium in the sunbelt, 7:31745
LOW LEVEL COUNTING
Statistics
Statistical aspects of the interpretation of counting experiments designed to detect low levels of radioactivity, 7:32418 (NRPB-R—113)
LOW-BETA PLASMA
Solitons
Two dimensional behavior of solitons in a low-β plasma with convective motion, 7:32863 (IPPJ—480)
LOW-HEAD HYDROELECTRIC POWER PLANTS
Construction
Powerhouse-gate: concept definition study, 7:31832 (DOE/ID/12200—T1)
Design
Powerhouse-gate: concept definition study, 7:31832 (DOE/ID/12200—T1)
Economic Analysis
Powerhouse-gate: concept definition study, 7:31832 (DOE/ID/12200—T1)
Feasibility Studies
Powerhouse-gate: concept definition study, 7:31832 (DOE/ID/12200—T1)
LOW-LEVEL RADIOACTIVE WASTES
Bibliographies
Low-level radioactive wastes. A bibliography of additions to the Energy Data Base in 1981, 7:31793 (DOE/TIC—3387)
Information Systems
Solid Waste Information Management System (SWIMS). Data summary, Fiscal Year 1980, 7:31794 (DOE/TIC—2005250)
Inventories
Solid Waste Information Management System (SWIMS). Data summary, Fiscal Year 1980, 7:31794 (DOE/TIC—2005250)
Nondestructive Analysis
Package receipt assay systems, 7:31792 (PNL-SA—10022)
Packaging
Package receipt assay systems, 7:31792 (PNL-SA—10022)
LUMINESCENT CONCENTRATORS
Development of materials for a luminescent solar collector. Annual progress report, Septemer 1, 1979-December 31, 1980, 7:31877 (DOE/ER/04996—2)
LUNGS
Biological Radiation Effects
Pathogenetic mechanism in lung fibrosis (Mice), 7:32585
Radionuclide Kinetics
In vivo measurement of actinides in the human lung, 7:32579
LWGR TYPE REACTORS
Fuel Cans
Evaluation of the axial elongation of a can of a fuel rod in the RBMK-type reactor under the conditions of cyclic power variation, 7:31936 (FEI—1089)

MA 956
See IRON BASE ALLOYS
MACHINING
Automation
Upgrading a production machine tool for precision machining, 7:32255 (Y—2264)
MAGMAMAX PROCESS
See BINARY-FLUID SYSTEMS
MAGNESIUM OXIDES
Synthesis
Clustering of metal atoms in organic media. 9. High-activity Ni/MgO catalysts prepared by metal vapor methods. Surface area and particle size effects, 7:32205
MAGNESIUM PHOSPHATES
Optical Properties
Optical properties of Nd^{3+} in metaphosphate glasses, 7:32187
MAGNETIC BREMSSTRAHLUNG
See SYNCHROTRON RADIATION
MAGNETIC FIELD CONFIGURATIONS
Analytical Solution
Magnetic field, vector potential, and their partial derivatives due to a current-carrying straight wire of finite length, 7:32900 (ORNL/CSD/TM—146)
MAGNETIC FIELDS
Three-Dimensional Calculations
GFUN3D program for computerizing three-dimensional magntostatic fields, 7:32914 (JINR—9-81-304)
MAGNETIC MATERIALS
See also FERROMAGNETIC MATERIALS
Magnetic materials and devices for high temperatures, 7:32466 (SAND—82-0425)
MAGNETIC PROBES
Hall probe applications, 7:32445 (GSI—81-2)
MAGNETIC SURFACES
See MAGNETIC FIELD CONFIGURATIONS
MAGNETIC TAPES
Energy Consumption
Energy use in three sectors of the electrical-engineering industry, 7:32123
Manufacturing
Energy use in three sectors of the electrical-engineering industry, 7:32123
MAGNETOMETERS
Magnetic field stabilization within the 1-10 mkT range by means of cesium quantum magnetometer, 7:32002 (JINR-R—13-12037)
Comparative Evaluations
High temperature magnetometer feasibility study, 7:31884 (SAND—82-0425)
MAINE
Energy Supplies
Comprehensive Energy Plan, 7:32093 (NP—2901890)
MAN
See also A-BOMB SURVIVORS
Radiation Doses
Problem of the validity of a specific activity model for tritium, 7:32533 (INIS-mf—6902)
Status report - transfer of C-14 from air to humans, 7:32507 (INIS-mf—6902)
MANGANESE
Leaching
Trace element characterization of coal wastes. Fifth annual progress report, October 1, 1979-September 30, 1980, 7:31728 (LA—8826-PR)
MANGANESE 54
Adsorption
Research and development related to the Nevada Nuclear Waste Storage Investigations. Progress report, April 1-June 30, 1981, 7:31795 (LA—8959-PR)
Biological Availability
Transfer of the corrosion nuclides ^{59}Fe, ^{54}Mn, ^{65}Zn, and ^{60}Co from ground to vegetation, 7:32514 (INIS-mf—6902)
Radionuclide Migration
Transfer from vegetation to meat, 7:32519 (INIS-mf—6902)
Transfer of the corrosion nuclides ^{59}Fe, ^{54}Mn, ^{65}Zn, and ^{60}Co from ground to vegetation, 7:32514 (INIS-mf—6902)
MANGANESE CHLORIDES
Cubic Lattices
Polytypism in $RbMnCl_3$. Neutron diffraction study of the cubic perovskite structure compound, 7:32207 (IA—1364)
Orthorhombic Lattices
Polytypism in $KMnCl_3$. Neutron diffraction study of the distorted perovskite structure compound, 7:32208 (IA—1364)
MANUFACTURING FACILITIES
See INDUSTRIAL PLANTS
MANURES
Anaerobic Digestion
Agricultural anaerobic digesters: design and operation, 7:31844 (NP—2901472)
MANY-BODY PROBLEM
See also FOUR-BODY PROBLEM
THREE-BODY PROBLEM
Sigma Model
Sigma model in many body problem, 7:32739 (INS—393)
MARINE ECOSYSTEMS
See AQUATIC ECOSYSTEMS
MARTENSITE
Fracture Properties
Investigation of the tensile deformation and fracture of a dual-phase steel, 7:32143 (DOE/ER/10556—86)
Microstructure
Investigation of the tensile deformation and fracture of a dual-phase steel, 7:32143 (DOE/ER/10556—86)
Tensile Properties
Investigation of the tensile deformation and fracture of a dual-phase steel, 7:32143 (DOE/ER/10556—86)
MASSACHUSETTS INSTITUTE TECHN. ALCATOR
See ALCATOR DEVICE
MATERIALS
See also BUILDING MATERIALS
FERROMAGNETIC MATERIALS
Standards
Variability of data--standards for applications, 7:32247
MATERIALS (BIOLOGICAL)
See BIOLOGICAL MATERIALS
MATERIALS (BUILDING)
See BUILDING MATERIALS
MATERIALS (DIELECTRIC)
See DIELECTRIC MATERIALS
MATERIALS (ENVIRONMENTAL)
See ENVIRONMENTAL MATERIALS
MATERIALS (FERROMAGNETIC)
See FERROMAGNETIC MATERIALS
MATERIALS (MAGNETIC)
See MAGNETIC MATERIALS
MATERIALS (SEMICONDUCTOR)
See SEMICONDUCTOR MATERIALS
MATERIALS TESTING
See also NONDESTRUCTIVE TESTING
Deformation
X-ray-measurable deformations in superficial layers and their representations, 7:32293
MAXWELL-BOLTZMANN EQUATION
See BOLTZMANN EQUATION
MEASURING INSTRUMENTS
See also BEAM MONITORS
DOSEMETERS
LEVEL INDICATORS
MAGNETOMETERS
MOISTURE GAGES
OXYGEN METERS
RADIATION DETECTORS
SPECTROMETERS
STRAIN GAGES
THERMOMETERS
Resolution
Inverse problem and account of the instrument resolution function, 7:32448 (IFVE-ONF—81-5)
Response Functions
Inverse problem and account of the instrument resolution function, 7:32448 (IFVE-ONF—81-5)
MECHANICAL STRUCTURES
See also SUPPORTS

Modifications
Rehabilitation, reinforcement and safety of steel structures, 7:32295
Reinforced Materials
Rehabilitation, reinforcement and safety of steel structures, 7:32295
Reliability
Application of reliability theory in structural mechanics, 7:32300
Safety and technical reliability, 7:32298
Safety
Safety and technical reliability, 7:32298
Safety Engineering
Rehabilitation, reinforcement and safety of steel structures, 7:32295

MECHANICAL TRANSMISSIONS
Performance Testing
Small passenger car transmission test: Chevrolet Malibu 200C transmission with lockup, 7:32131 (DOE/NASA/0124—6)

MEMBRANES
Cost
Alcohol fuels program technical review, 7:31840 (DOE/TIC—2006904)
Evaluation
Alcohol fuels program technical review, 7:31840 (DOE/TIC—2006904)

MENDELEVIUM
Chemical Properties
Chemical properties of the heavier actinides and transactinides, 7:32237 (UCRL—85944)
Electronic Structure
Chemical properties of the heavier actinides and transactinides, 7:32237 (UCRL—85944)
Polarography
Radiopolarography of mendelevium in aqueous solutions, 7:32243

MENTAL DISORDERS
Diagnostic Techniques
Assessment of regional glucose metabolism in aging brain and dementia with positron-emission tomography, 7:32540 (BNL—30551)

MERCURY
Biogeochemistry
Biogeochemistry of toxic metals, 7:32488
Ecological Concentration
Exposure to heavy metals from foods, 7:32500
Leaching
Trace element characterization of coal wastes. Fifth annual progress report, October 1, 1979-September 30, 1980, 7:31728 (LA—8826-PR)

MERCURY TELLURIDES
Ion Scattering Analysis
Observation of surface dissociation of HgTe crystal by means of 42MeV-O^{8+} backscattering, 7:32717

MESH GENERATION
Computer Codes
NENEG: programma per la generazione automatica di reticoli per codici di calcolo ad elementi finiti tridimensionali, 7:32912 (CNEN-RT/ING—80-27)

MESON SPECTROSCOPY
Lectures
Review of meson spectroscopy: quark states and glueballs, 7:32709 (LBL—13593)
Quark Model
Meson spectroscopy: quark states and glueballs, 7:32743 (SLAC—245)
Reviews
Meson spectroscopy: quark states and glueballs, 7:32743 (SLAC—245)

METABOLIC DISEASES
Diagnosis
Critical assessment of bone scan quantitation (bone to soft tissue ratios) in the diagnosis of metabolic bone disease, 7:32553

METALS
See also ACTINIDES
ALKALI METALS
SCRAP METALS
Amorphous State
Amorphous metals: cutting losses in the core, 7:32086
Creep
Prediction of the behavior of structural materials under irradiation through modeling of the microstructure. Progress report, November 1, 1980-October 31, 1981. Final report, 7:32136 (DOE/ER/04861—3)
Ecological Concentration
Heavy metal contents of leaf vegetables in relation to increasing amounts of garbage sewage sludge composts applied in pot experiments, 7:32503
Relation between the location and the heavy metal contents of vegetables, 7:32501
Interfaces
Interface hydrodynamic plasmon solutions of the Boltzmann equation, 7:32829 (DOE/ER/10890—1)
Magnetic Properties
Amorphous metals: cutting losses in the core, 7:32086
Microstructure
Prediction of the behavior of structural materials under irradiation through modeling of the microstructure. Progress report, November 1, 1980-October 31, 1981. Final report, 7:32136 (DOE/ER/04861—3)
Physical Radiation Effects
Prediction of the behavior of structural materials under irradiation through modeling of the microstructure. Progress report, November 1, 1980-October 31, 1981. Final report, 7:32136 (DOE/ER/04861—3)
Rates of defect production by fission neutrons in metals at 4.7 K, 7:32163
Radiation Effects
Proceedings of the 7. Bakurianian school on radiation physics of metals and alloys, 7:32152 (INIS-SU—61)
X-Ray Spectra
Many-body effects on the x-ray spectra of metals, 7:32828 (DOE/ER/01198—1372)

METAMORPHIC ROCKS
Isotope Dating
K-Ar radiometric age determinations of the south-Alpine metamorphic complex, western Orobic Alps (Italy), 7:32597

METEOROLOGY
Effect of spatial variability of meteorological data on annual average air concentrations predicted by a wind-rose model (Savannah river plant), 7:32476
Interaction of the atmospheric boundary layer with large-scale processes over the Bay of Bengal during MONEX79, 7:32472 (BNL—30322)
Mathematical Models
Nocturnal drainage flow over complex terrain using a generalized shallow fluid approximation, 7:32477

METER WAVE RADIATION
See RADIOWAVE RADIATION

METHANATION
Catalysts
Hydrogenation of carbon monoxide over rhodium oxide surfaces (At 250 to 350°C and 6 atm), 7:31827
Integrated approach to the systematic synthesis, characterization, and catalytic activity of novel heterogeneous catalysts. Final progress report, 7:32206 (DOE/ER/10381—3)

METHANE
Chemical Preparation
Hydrogenation of carbon monoxide over rhodium oxide surfaces (At 250 to 350°C and 6 atm), 7:31827
Hydrogenolysis of carbon and its catalysis by platinum, 7:31722
Solvent Extraction
Solvent extraction of methane from simulated geopressured-geothermal fluids: sub-pilot test results, 7:31896 (UCID—19291)
Synthesis
Methane and methanol synthesis over supported palladium catalysts, 7:31830

METHANOL
Adsorption
Photoelectron spectroscopy of methyl, ethyl and isopropyl alcohol adsorbed on the (110) surface of Cu, 7:32713
Dissociation
Alcohol fuels program technical review, 7:31840 (DOE/TIC—2006904)
Photoelectron Spectroscopy
Photoelectron spectroscopy of methyl, ethyl and isopropyl alcohol adsorbed on the (110) surface of Cu, 7:32713
Solvent Properties
Macromolecular structural changes in bituminous coals during extraction and solubilization. Quarterly technical progress report, 1 September 1981-1 December 1981, 7:31724 (DOE/PC/30222—T2)
Synthesis
Alcohol fuels program technical review, 7:31840 (DOE/TIC—2006904)
Methane and methanol synthesis over supported palladium catalysts, 7:31830
METHYLENE CHLORIDE
Binding Energy
Weak binding gases as modulators of hemoglobin function, 7:32567
Biological Effects
Weak binding gases as modulators of hemoglobin function, 7:32567
Crystallography
Weak binding gases as modulators of hemoglobin function, 7:32567
METHYLENE RADICALS
Chemical Reactions
Studies in chemical reactivity. Progress report, November 30, 1980-1 December 1981, 7:32222 (DOE/ER/02026—41)
METHYLIDENE RADICALS
See METHYLENE RADICALS
MHD POWER PLANTS
Cost
Summary and evaluation of the conceptual design study of a potential early commercial MHD power plant (CSPEC), 7:32109 (DOE/NASA/10769—21)
Design
Summary and evaluation of the conceptual design study of a potential early commercial MHD power plant (CSPEC), 7:32109 (DOE/NASA/10769—21)
Systems Analysis
Coal-fired open cycle MHD combustion plasmas: chemical equilibrium and transport properties workshop results, 7:32107
MICROSPHERES
Measuring Methods
Method and apparatus for determining diameter and wall thickness of minute hollow spherical shells (Patent), 7:32162
Surface Coating
Sputter coating of microspherical substrates by levitation (Patent), 7:31823
Thickness
Method and apparatus for determining diameter and wall thickness of minute hollow spherical shells (Patent), 7:32162
MIDDLE DISTILLATES
See PETROLEUM DISTILLATES
MIGRATION (RADIONUCLIDE)
See RADIONUCLIDE MIGRATION
MIHAMA-1 REACTOR
Fuel Element Failure
Research report on fuel failure in Mihama Unit 1 nuclear power plant, 7:31927 (KURRI-TR—197)
MILITARY FACILITIES
Passive Solar Heating Systems
Passive solar retrofit study for the United States Navy, 7:31869 (LA—9071-MS)
MILK
Contamination
Situation and analysis of residues in milk, 7:32499
MILL TAILINGS
See also ORE PROCESSING
Engineered Safety Systems
Use of controlled release herbicides in waste burial sites, 7:31818 (PNL-SA—9503)
MINE HAULAGE
Comparative Evaluations
Trends of development in opencast mining at increased diesel prices, 7:32308
Economics
Trends of development in opencast mining at increased diesel prices, 7:32308
MINE-MOUTH GENERATING PLANTS
See FOSSIL-FUEL POWER PLANTS
MINERAL WASTES
Calcination
Trace element characterization of coal wastes. Fifth annual progress report, October 1, 1979-September 30, 1980, 7:31728 (LA—8826-PR)
Chemical Analysis
Trace element characterization of coal wastes. Fifth annual progress report, October 1, 1979-September 30, 1980, 7:31728 (LA—8826-PR)
Coatings
Trace element characterization of coal wastes. Fifth annual progress report, October 1, 1979-September 30, 1980, 7:31728 (LA—8826-PR)
Leaching
Trace element characterization of coal wastes. Fifth annual progress report, October 1, 1979-September 30, 1980, 7:31728 (LA—8826-PR)
Waste Disposal
Trace element characterization of coal wastes. Fifth annual progress report, October 1, 1979-September 30, 1980, 7:31728 (LA—8826-PR)
MINERALS
See also DIAMONDS
FERRITE GARNETS
KAOLINITE
Sorptive Properties
Adsorption of technetium on selected inorganic ion-exchange materials and on a range of naturally occurring minerals under oxic conditions, 7:32244
MINES
Ground Subsidence
Numerical prediction of subsidence with coupled geomechanical-hydrological modeling, 7:32594 (LA-UR—81-3700)
MISSISSIPPI
Severance Tax
Severance taxes on coal and uranium in the sunbelt, 7:31745
MIXERS
Energy Consumption
Investigation of power consumption, suspension and flooding characteristics of stirred, aerated slurry reactors, 7:32124
MODELS (COSMOLOGICAL)
See COSMOLOGICAL MODELS
MODELS (STRUCTURAL)
See STRUCTURAL MODELS
MOESSBAUER SPECTROMETERS
Servomechanisms
Design of a servo system for a Moessbauer spectrometer, 7:32443 (AERE-R—10207)
Moessbauer spectrometer for difficult isotopes, 7:32368 (AERE-R—10206)
MOISTURE
See also WATER
Measuring Methods
Neutron probe and the detection of soil moisture, 7:32425
MOISTURE GAGES
Performance Testing
Neutron probe and the detection of soil moisture, 7:32425
MOLDS
See FUNGI
MOLTEN CARBONATE FUEL CELLS
Energy Demand
Oak Ridge Industrial Model: an introduction, 7:32091 (CONF-801152—3)

MOLYBDENUM
Chemical Properties
Molybdenum and its analyses, 7:32132 (BDX—613-2730)
Electronic Structure
Molybdenum and its analyses, 7:32132 (BDX—613-2730)
Foam Separation
Concentration of trace elements from Cheleken peninsula thermal brines by means of foam flotation, 7:32195 (JINR—6-81-75)
Physical Properties
Molybdenum and its analyses, 7:32132 (BDX—613-2730)
Sputtering
Monte Carlo calculations of light-ion sputtering as a function of the incident angle, 7:32716
MOLYBDENUM 94 TARGET
Proton Reactions
Direct experimental evidence for strong sequential two-step transfer process in allowed (p,t) reactions, 7:32782 (UTTAC—38)
MOLYBDENUM ALLOYS
Chemical Properties
Molybdenum and its analyses, 7:32132 (BDX—613-2730)
Electronic Structure
Molybdenum and its analyses, 7:32132 (BDX—613-2730)
Physical Properties
Molybdenum and its analyses, 7:32132 (BDX—613-2730)
MOLYBDENUM BORIDES
Corrosion Resistance
Composition for use in high-temperature hydrogen-fluorine environments and method for making the composition (Patent), 7:32175
MOLYBDENUM COMPLEXES
Catalytic Effects
Integrated approach to the systematic synthesis, characterization, and catalytic activity of novel heterogeneous catalysts. Final progress report, 7:32206 (DOE/ER/10381—3)
MOLYBDENUM ISOTOPES
Charge-Exchange Reactions
Energy splitting between the $T=T_0$ and $T=T_0$-1 components of the charge-exchange vector dipole resonance, 7:32774 (IFUSP-P—246)
MOLYBDENUM OXIDES
Catalytic Effects
Preparation of bimodal aluminas an molybdena/alumina extrudates, 7:31721
Chemical Preparation
Preparation of bimodal aluminas an molybdena/alumina extrudates, 7:31721
Microstructure
Preparation of bimodal aluminas an molybdena/alumina extrudates, 7:31721
Porosity
Preparation of bimodal aluminas an molybdena/alumina extrudates, 7:31721
MONAZITES
Sorptive Properties
Adsorption of technetium on selected inorganic ion-exchange materials and on a range of naturally occurring minerals under oxic conditions, 7:32244
MONOCRYSTALS
Drawing
Method and apparatus for drawing monocrystalline ribbon from a melt (Patent), 7:32186
Electron Collisions
Effect of electron beam parameters on the coherent bremsstrahlung in monocrystals, 7:32810 (IFVE-OP—81-17)
MONTANA
Natural Gas Deposits
Shallow unconventional gas applications study. Final report, 7:31768 (DOE/BC/10003—19)
MONTMORILLONITE
Sorptive Properties
Adsorption of technetium on selected inorganic ion-exchange materials and on a range of naturally occurring minerals under oxic conditions, 7:32244
MORTALITY
Geographical Variations
Multivariate methods for assessing disease/environment association: conceptual versus geographic regions, 7:32569
MOS TRANSISTORS
Failures
Materials and interfaces for high temperature MOS and CMOS components, 7:31886 (SAND—82-0425)
Performance Testing
Materials and interfaces for high temperature MOS and CMOS components, 7:31886 (SAND—82-0425)
Temperature Effects
Materials and interfaces for high temperature MOS and CMOS components, 7:31886 (SAND—82-0425)
MUELHEIM-KAERLICH REACTOR
Primary Coolant Circuits
PWR reactors for BBR nuclear power plants, 7:31935 (INIS-mf—6840)
Steam Systems
PWR reactors for BBR nuclear power plants, 7:31935 (INIS-mf—6840)
MULTI-CHANNEL ANALYZERS
CAMAC System
Multi-channel amplitude analyzer on the basis of the MERA-60 microcomputer, 7:32451 (JINR—13-81-11)
MULTIWIRE PROPORTIONAL CHAMBERS
See also DRIFT CHAMBERS
Algorithm for electron fast track recognition in C-detector of the ARES spectrometer, 7:32404 (JINR—11-81-300)
Data Processing
ADSERV computer code for data processing from proportional chambers, 7:32401 (ITEF—176(1980))
Particle Tracks
ADSERV computer code for data processing from proportional chambers, 7:32401 (ITEF—176(1980))
Performance
High resolution, high counting rate bidimensional, MWPC imaging detector for small angle X-ray diffraction studies, 7:32421 (RL—81-053)
X-Ray Detection
High resolution, high counting rate bidimensional, MWPC imaging detector for small angle X-ray diffraction studies, 7:32421 (RL—81-053)
MUNICIPAL WASTES
Waste Processing
Apparatus for measuring chloride emissions from refuse incineration, 7:32465
MUNITIONS
See ORDNANCE
MUON DETECTION
Cherenkov Counters
Applications of the Cleveland salt mine detector to cosmic rays and cosmology, 7:32437
Fluorescent light detector in Dumand, 7:32428
Cosmic Ray Detection
Neutron emission in the case of the capture of the cosmic ray μp-meson component in a lead sample, 7:32611
DUMAND Project
Advances in detectors for Dumand arrays, 7:32427
Experiment project of $\mu\nu$ detection in shallow underwater, 7:32435
Muons with high energy transfer in Dumand, 7:32432
Separation of hadronic and electromagnetic interactions of muons in Dumand, 7:32433
Ultra high energy primary composition and interaction studies with Dumand, 7:32431
Scintillation Counters
μ-e decay investigation at the Mt. Blanc station, 7:32439
MUON REACTIONS
Fission
Calculation of muon final probabilities after muon-induced fission in a four-state basis, 7:32802
MUONS
See also COSMIC MUONS

Excited States
Search for excited leptons in the next generation of experiments, 7:32722 (DOE/ER/03285—40)
Pulse Rise Time
Muon time spreads in EAS, 7:32618
MUTAGEN SCREENING
Drosophila
History of attempts to quantify environmental mutagenesis, 7:32586 (BNL—30356)
Laboratory Animals
History of attempts to quantify environmental mutagenesis, 7:32586 (BNL—30356)
MUTAGENS
Biological Indicators
Sperm assays in man and other mammals as indicators of chemically induced testicular dysfunction, 7:32588
Quantitative Chemical Analysis
History of attempts to quantify environmental mutagenesis, 7:32586 (BNL—30356)
MYOCARDIUM
Scintiscanning
Evaluation of image processing and presentation methods in thallium-201 myocardial scintigraphy, 7:32557

N

NAI DETECTORS
Four-Pi Counting
Status of the NaI crystal ball project, 7:32382 (GSI—81-2)
NATIONAL ACCELERATOR LABORATORY
See FERMILAB ACCELERATOR
NATIONAL SYNCHROTRON LIGHT SOURCE
See NSLS
NATURAL CIRCULATION
See NATURAL CONVECTION
NATURAL CONVECTION
Numerical Solution
Numerical investigation of natural convection in a Hele-Shaw gap heated from below, 7:32272 (KFK—3142)
NATURAL GAS
Enhanced Recovery
Fracture of Devonian shale by tailored pulse-loading. Final report, August 15, 1977-August 15, 1978, 7:31769 (DOE/ET/12074—T1)
Mixing
Systems analysis of hydrogen supplementation in natural gas pipelines, 7:31771 (BNL—30440)
Transport
Systems analysis of hydrogen supplementation in natural gas pipelines, 7:31771 (BNL—30440)
NATURAL GAS DEPOSITS
Energy Source Development
Shallow unconventional gas applications study. Final report, 7:31768 (DOE/BC/10003—19)
Exploration
Twelfth annual Appalachian Petroleum Geology Symposium. Appalachian thrust belt/tight sands/shale gas. Circular No. C-20, 7:31749 (CONF-8103124—Absts)
Geology
Shallow unconventional gas applications study. Final report, 7:31768 (DOE/BC/10003—19)
NATURAL GAS INDUSTRY
Investment
Investment requirements in the energy sector and their financing, 7:32097 (NP—2901055)
Legislation
1980 Legal Report of Oil and Gas Conservation Activities, 7:31754 (NP—2901180)
NATURAL GAS WELLS
Explosive Fracturing
Fracture of Devonian shale by tailored pulse-loading. Final report, August 15, 1977-August 15, 1978, 7:31769 (DOE/ET/12074—T1)
Fracture of Devonian shale by tailored pulse-loading. Quarterly progress report 2, January 1-March 31, 1978, 7:31770 (DOE/ET/12074—T3)
NATURAL LIGHTING
See DAYLIGHTING
NATURAL RADIOACTIVITY
(For unspecified naturally occuring radioisotopes only; not for BACKGROUND RADIATION.)
Two decades of research in the Brazilian areas of high natural radioactivity, 7:32521 (PUC-tn—02/80)
NEBRASKA
Energy Management
Nebraska Energy Office. Annual report, 1981, 7:32094 (NP—2902311)
Energy Policy
Nebraska Energy Office. Annual report, 1981, 7:32094 (NP—2902311)
Energy Supplies
Nebraska Energy Office. Annual report, 1981, 7:32094 (NP—2902311)
NEODYMIUM 143 TARGET
Neutron Reactions
Study on the (n, α) reactions on ^{147}Sm, ^{149}Sm, ^{143}Nd isotopes at 2 keV neutron energy using Sc filtered beam, 7:32779 (JINR-R—3-80-779)
NEODYMIUM IONS
Absorption Spectroscopy
Optical properties of Nd^{3+} in metaphosphate glasses, 7:32187
Emission Spectra
Development of materials for a luminescent solar collector. Annual progress report, Septemer 1, 1979-December 31, 1980, 7:31877 (DOE/ER/04996—2)
Energy Transfer
Development of materials for a luminescent solar collector. Annual progress report, Septemer 1, 1979-December 31, 1980, 7:31877 (DOE/ER/04996—2)
Fluorescence
Optical properties of Nd^{3+} in metaphosphate glasses, 7:32187
NEON
Diffusion
Mound Facility activities in chemical and physical research: January-June 1981, 7:31825 (MLM—2884)
NEON 20
Collective Model
Interacting sp-boson model with isospin: an unified description of giant multipole resonances and other collective motions, 7:32797 (IFUSP-P—240)
NEOPENTANE
See 2-2-DIMETHYLPROPANE
NEPTUNIUM 237
Gamma Spectroscopy
In situ subterranean determination of actinides by high-resolution gamma-ray spectrometry, 7:31817 (PNL-SA—8992)
NEPTUNIUM COMPOUNDS
Oxidation
Electrochemical and spectroscopic studies of neptunium(VI), -(V) and -(IV) in carbonate-bicarbonate buffers, 7:32240
Reduction
Electrochemical and spectroscopic studies of neptunium(VI), -(V) and -(IV) in carbonate-bicarbonate buffers, 7:32240
NEPTUNIUM HYDRIDES
Moessbauer Effect
Moessbauer effect studies of Npsub(x)Pusub(1-x) ($0.15 <= x <= 1$) dihydrides, 7:32700 (IA—1364)
NETWORK ANALYSIS
Flow Models
Code for Dinic's maximum flow algorithm (MAXFLO), 7:32923 (SAND—81-1927)
NETWORKS (COMPUTER)
See COMPUTER NETWORKS
NEUTRAL BEAM SOURCES
See also ION SOURCES
Ion Sources
Computer aided extractor design for the RIG 10 high intensity ion source, 7:32328 (GKSS—80/E/33)

NEUTRINO DETECTION
Neutrino moments: the applications for calculation of the rate of events in neutrino detectors, 7:32436
Cherenkov Counters
Applications of the Cleveland salt mine detector to cosmic rays and cosmology, 7:32437
Fluorescent light detector in Dumand, 7:32428
DUMAND Project
Advances in detectors for Dumand arrays, 7:32427
Experiment project of $\mu\nu$ detection in shallow underwater, 7:32435
Sensitivity of Dumand arrays to extraterrestrial neutrino fluxes, 7:32434
NEUTRINO-NUCLEON INTERACTIONS
See also ANTINEUTRINO-NUCLEON INTERACTIONS
Charged-Current Interactions
Recent results on total neutrino and antineutrino cross sections by the CFRR collaboration, 7:32724 (FERMILAB-Conf—81/80-Exp.)
Cross Sections
Recent results on total neutrino and antineutrino cross sections by the CFRR collaboration, 7:32724 (FERMILAB-Conf—81/80-Exp.)
Total Cross Sections
Recent results on total neutrino and antineutrino cross sections by the CFRR collaboration, 7:32730 (SLAC—245)
NEUTRINOS
Acceleration
Monte Carlo study of neutrino acceleration in supernova shocks, 7:32684
Magnetic Moments
Neutrino moments: the applications for calculation of the rate of events in neutrino detectors, 7:32436
Oscillations
Effects of oscillations on neutrinos generated by cosmic rays in the earth's atmosphere, 7:32733
NEUTRON CAPTURE THERAPY
Side Effects
Study on lethal effect on cells by determination of ^{10}B in biological tissues and (n, α) reaction. Quantitative determination of ^{10}B in biological tissues by soiled state track detection, 7:32571 (KURRI-TR—195)
NEUTRON DETECTION
Measuring Methods
Neutron measurement techniques for the nondestructive analysis of irradiated fuel assemblies, 7:31820 (LA—9002-MS)
Plastic Scintillation Detectors
Modified version of the Monte Carlo computer code for calculating neutron detection efficiencies, 7:32391 (IFUSP-P—250)
NEUTRON DETECTORS
See also ACTIVATION DETECTORS
HE-3 COUNTERS
Calibration
Development and calibration of NE 213 neutron detectors with pulse shape discrimination, 7:32388 (GSI—81-2)
Neutron Dosimetry
International comparison of means for measurement of neutron spectra and radiation doses in the IBR-30 reactor beam, 7:32003 (JINR-R—16-80-448)
Pulse Discriminators
Development and calibration of NE 213 neutron detectors with pulse shape discrimination, 7:32388 (GSI—81-2)
NEUTRON DIFFRACTION
Diffraction from crystals. Chapter 6.5. Neutron diffraction structure analysis, 7:32818
Cross Sections
Dynamical susceptibility and neutron scattering cross section of a model mixed-valence system, 7:32821
NEUTRON DIFFUSION EQUATION
Fast neutron physics. Estimation of the results of diffusion theory applied to small dimension systems, 7:31961 (CTA-EAV—024/79)
Finite Difference Method
Parallel computation for neutron diffusion equation, 7:31972 (JAERI-M—9235)
NEUTRON DOSIMETRY
Interlaboratory niobium dosimetry comparison. The contribution of the GKSS-Forschungszentrum Geesthacht, 7:32374 (GKSS—80/E/36)
NEUTRON FLUX
Multigroup Theory
Computer code for neutron group calculation of a cylindrical reactor cell (NEGR-Ts), 7:31969 (IAE—3377/5)
NEUTRON MOISTURE METERS
See MOISTURE GAGES
NEUTRON MULTIPLIER FACILITY
See SUBCRITICAL ASSEMBLIES
NEUTRON REACTIONS
Capture
E2 isovector giant resonance as seen through the capture of fast neutrons, 7:32795 (LA—9026)
Cross Sections
Evaluation of neutron nuclear data for ^{45}Sc, 7:32770 (NEANDC(J)—80/U)
Meetings
Neutron physics. Part 1. Proceeding of the 5. All-union conference on neutron physics, 7:32811 (INIS-SU—40)
Pickup Reactions
Study on the (n, α) reactions on ^{147}Sm, ^{149}Sm, ^{143}Nd isotopes at 2 keV neutron energy using Sc filtered beam, 7:32779 (JINR-R—3-80-779)
Resonance Scattering
Parameters of osmium neutron resonances in 6 - 60 eV range, 7:32783 (JINR-R—3-81-19)
NEUTRON SOURCES
(Excludes reactors even when used as neutron sources.)
Study on the neutron yield from thick targets under the action of 645 MeV protons, 7:32766 (JINR—18-80-540)
NEUTRON SPECTROMETERS
Measuring module of spectrometer of neutron small angle scattering on the IBR pulse reactor, 7:32001 (JINR-R—10-80-826)
NEUTRON TRANSPORT
Meetings
Neutron physics. Part 1. Proceeding of the 5. All-union conference on neutron physics, 7:32811 (INIS-SU—40)
NEUTRON TRANSPORT THEORY
Neutron Diffusion Equation
Fast neutron physics. Estimation of the results of diffusion theory applied to small dimension systems, 7:31961 (CTA-EAV—024/79)
NEUTRON-NEUTRON LOGGING
Calibration
PFN tool test and calibration system (Prompt Fission Neutron), 7:31781 (SAND—80-0064)
Equipment
PFN tool test and calibration system (Prompt Fission Neutron), 7:31781 (SAND—80-0064)
NEUTRONS
See also THERMAL NEUTRONS
Inelastic Scattering
Inelastic neutron scattering studies of single crystal TmSe, 7:32820
NEW MEXICO
Salt Deposits
Analysis of creep data for various natural rock salts, 7:32184 (SAND—81-2567)
Severance Tax
Severance taxes on coal and uranium in the sunbelt, 7:31745
NEW YORK
Radioactive Waste Storage
Environmental surveillance plan for the Department of Energy's Niagara Falls Storage Site (NFSS), Lewiston, New York, 7:31797 (NLCO—008EV)
NICKEL
Catalytic Effects
Clustering of metal atoms in organic media. 9. High-activity Ni/MgO catalysts prepared by metal vapor methods. Surface area and particle size effects, 7:32205

Charged-Particle Transport
Stopping power measurements with the modified UNILAC TOF-system, 7:32808 (GSI—81-2)
Complexometry
Effect of organic complexants on the mobility of low level waste radionuclides in soils, 7:31805 (PNL-SA—10019)
Electrodeposited Coatings
Potentiometric determination of percent porosity in nickel electroplates on uranium metal, 7:32161 (Y/DW—282)
Ion Collisions
Model for H^-, D^- production by hydrogen backscattering form alkali and alkali/transition-metal surfaces (Marlowe Code), 7:32907
Lattice Parameters
Cobalt distribution in $LaNi_4Co$. A neutron diffraction study, 7:32209 (IA—1364)
Crystallographic structure of LaNisub(4)CoDsub(y). A neutron diffraction study, 7:32210 (IA—1364)
Leaching
Trace element characterization of coal wastes. Fifth annual progress report, October 1, 1979-September 30, 1980, 7:31728 (LA—8826-PR)
Magnetic Fields
Study of hyperfine magnetic fields on the impurity of Sm in Fe and Ni ferromagnetic lattices, 7:32154 (JINR-R—14-81-177)
Optical Properties
Optical absorption spectroscopy of molecules adsorbed on Ni(111) and energy transfer from the ^{3}eta π^* state of pyrazine to Ni(111) and Ag(111) surfaces, 7:32156 (LBL—13623)
Sorption
Effect of organic complexants on the mobility of low level waste radionuclides in soils, 7:31805 (PNL-SA—10019)
Sorptive Properties
Transfer matrix treatment of atomic chemisorption on transition metal surface, 7:32159 (PUC-tn—07/80)
Sputtering
Monte Carlo calculations of light-ion sputtering as a function of the incident angle, 7:32716
Surface Coating
Optical absorption spectroscopy of molecules adsorbed on Ni(111) and energy transfer from the ^{3}eta π^* state of pyrazine to Ni(111) and Ag(111) surfaces, 7:32156 (LBL—13623)
Synthesis
Clustering of metal atoms in organic media. 9. High-activity Ni/MgO catalysts prepared by metal vapor methods. Surface area and particle size effects, 7:32205
Toxicity
Combined effects of nickel, chlorine, and temperature on the mortality of rainbow trout, Salmo gairdneri, 7:32589

NICKEL 60 TARGET
Proton Reactions
Intermediate structure in proton resonances, 7:32771 (JINR-R—15-80-786)

NICKEL ALLOYS
Solubility
Investigation into carbon diffusion in multicomponent iron alloys with chromium, nickel, molybdenum and niobium in the range of γ-solid solutions, 7:32145 (FEI—1113)

NICKEL COMPLEXES
Catalytic Effects
Integrated approach to the systematic synthesis, characterization, and catalytic activity of novel heterogeneous catalysts. Final progress report, 7:32206 (DOE/ER/10381—3)

NICKEL-CADMIUM BATTERIES
Performance Testing
Development of a modularized battery, 7:32070 (NP—2901049)

NIOBIUM
Sputtering
Target sputtering by multicharged heavy ion beams, 7:32711 (RI—120)

NIOBIUM 93 TARGET
Charge-Exchange Reactions
Energy splitting between the $T=T_0$ and $T=T_0$-1 components of the charge-exchange vector dipole resonance, 7:32774 (IFUSP-P—246)

NIOBIUM ALLOYS
Critical Current
Nb-Ti base high-field superconductors with current capacities in excess of 3000 A for application in magnet systems with alternating field components, 7:32844 (BMFT-FB-T—81-009)
Superconductivity
Nb-Ti base high-field superconductors with current capacities in excess of 3000 A for application in magnet systems with alternating field components, 7:32844 (BMFT-FB-T—81-009)

NITRATES
Biodegradation
Design of fluidized-bed, biological denitrification systems, 7:32527 (ORNL/TM—7628)
Denitrification
Design of fluidized-bed, biological denitrification systems, 7:32527 (ORNL/TM—7628)
Solvent Properties
Crown ethers as size-selective synergists in solvent extraction systems: a new selectivity parameter, 7:32218

NITROGEN
Ion-Atom Collisions
Reactions of ions with atomic and molecular free radicals. Progress report, May 1, 1981-April 30, 1982 (Summaries of research activities at the University of Minnesota), 7:32693 (DOE/ER/02640—13)

NITROGEN DIOXIDE
Chemical Radiation Effects
Gas phase negative ion reactions on electron irradiation of NO_2, 7:32223 (INR—1746/17/C/A)

NITROGEN OXIDES
See also NITROGEN DIOXIDE
Pollution Regulations
Trade-offs in NO/sub x/ control, 7:32311

NOBELIUM
Chemical Properties
Chemical properties of the heavier actinides and transactinides, 7:32237 (UCRL—85944)
Electronic Structure
Chemical properties of the heavier actinides and transactinides, 7:32237 (UCRL—85944)

NOBLE GASES
See RARE GASES

NONAXIAL NUCLEI
See DEFORMED NUCLEI

NONDESTRUCTIVE TESTING
See also INDUSTRIAL RADIOGRAPHY
Meetings
Safety in nuclear engineering by means of nondestructive testing, 7:32042

NON-EQUILIBRIUM PLASMA
Correlation Functions
Ifluence of the collisions of electrons and ions with atoms and molecules on the dynamic form-factors of bounded many-particle systems, 7:32871 (ITP—80-108-E)

NORTH CAROLINA
Severance Tax
Severance taxes on coal and uranium in the sunbelt, 7:31745

NORTH DAKOTA
Natural Gas Deposits
Shallow unconventional gas applications study. Final report, 7:31768 (DOE/BC/10003—19)

NORTHERN IRELAND
See UNITED KINGDOM

NOVO VORONEZH-2 REACTOR
See WWER-2 REACTOR

NOZZLES
Design
Mechanical, thermal and hydraulic design of a monometallic water-cooled gas turbine nozzle, 7:31906

Hydrodynamics
Holographic investigation of nonequilibrium vapor generation in a two-dimensional nozzle (PWR; BWR), 7:32016 (EGG-M—02381)
Performance
Mechanical, thermal and hydraulic design of a monometallic water-cooled gas turbine nozzle, 7:31906
Two-Phase Flow
Holographic investigation of nonequilibrium vapor generation in a two-dimensional nozzle (PWR; BWR), 7:32016 (EGG-M—02381)

NSLS
Biophysics
Synchrotron radiation sources for photobiology and ultraviolet, visible and infrared spectroscopy, 7:32424
Data Acquisition Systems
Data acquisition and experiment control system for high-data-rate experiments at the National Synchrotron Light Source, 7:32327 (BNL—30337)

NUCLEAR EXPLOSIONS
Biological Effects
Heat and blast effects of nuclear detonations on desert biota, 7:32470 (PNL-SA—9630)
Environmental Effects
Heat and blast effects of nuclear detonations on desert biota, 7:32470 (PNL-SA—9630)
Mathematical Models
Should we trust models or observations (Effects of supersonic transport and atmospheric nuclear tests on the ozone layer), 7:32483

NUCLEAR FACILITIES
See also FUEL REPROCESSING PLANTS
ISOTOPE SEPARATION PLANTS
Reliability
Importance parameters for reliability analyses of systems, 7:32066
Systems Analysis
Importance parameters for reliability analyses of systems, 7:32066

NUCLEAR INDUSTRY
Turbogenerators
French electromechanical industry in the nuclear sector, 7:31915 (FRNC-CONF—206)

NUCLEAR MATERIALS MANAGEMENT
Accounting
Neutron measurement techniques for the nondestructive analysis of irradiated fuel assemblies, 7:31820 (LA—9002-MS)

NUCLEAR MATTER
Fluid Mechanics
Studies of the nuclear equation of state using numerical calculations of nuclear drops collisions, 7:32606 (UCRL—86964)
Phase Transformations
Research in theoretical physics. Annual progress report, April 1, 1981-March 31, 1982, 7:32738 (DOE/ER/03285—41)
Quarks
Research in theoretical physics. Annual progress report, April 1, 1981-March 31, 1982, 7:32738 (DOE/ER/03285—41)

NUCLEAR PHYSICS
Meetings
Proceedings of the 1979 seminar on nuclear data, 7:32763 (JAERI-M—8769)
Progress report of the Teilinstitut Nukleare Festkoerperphysik of the Institut fuer Angewandte Kernphysik from June 1st, 1979 to May 31st, 1980, 7:32764 (KFK—3051)
Workshop report of nuclear physics to be studied by NUMATRON accelerator, 7:32762 (INS-NUMA—18)

NUCLEAR POWER PLANTS
Comparative Evaluations
Decision framework for technology choice. Volume 1. A case study of one utility's coal-nuclear choice, 7:32098 (EPRI-EA—2153-Vol.1)
Control Rooms
Study for standardization of nuclear power plant control panels, 7:31997 (KAERI/RR—224/80)
Environmental Impacts
Environmental, legal and political constraints on power plant siting in the southwestern United States. Special Series 16, 7:31911 (NP—2902471)
Fluid Flow
Fluid-structure interaction--a survey with emphasis on its application to nuclear steam system design, 7:31932
Fuel Element Clusters
Vibration of a group of circular cylinders subjected to fluid flow, 7:31990
Heat Exchangers
Vibration of a group of circular cylinders subjected to fluid flow, 7:31990
Hydrodynamics
Fluid-structure interaction--a survey with emphasis on its application to nuclear steam system design, 7:31932
Land Use
Environmental, legal and political constraints on power plant siting in the southwestern United States. Special Series 16, 7:31911 (NP—2902471)
Legal Aspects
Environmental, legal and political constraints on power plant siting in the southwestern United States. Special Series 16, 7:31911 (NP—2902471)
Mechanical Vibrations
Long-life fatigue of type 316 stainless steel of temperatures up to 593 C, 7:31986
Meetings
Structural considerations and findings from testing of nuclear components (symposium), 1981, 7:32010
Pipes
Dynamic analysis techniques--a sensitivity study for piping systems at a nuclear power plant, 7:32065
Evaluation of dynamic load combination fatigue damage, 7:32048
Evaluation of pipe support stiffness and its effect on piping response, 7:32064
Generic methods for design of small-bore pipe supports, 7:32063
Pressure Vessels
Monitoring of nuclear power plant reactor vessel thermal transients and fatigue usage factors, 7:32046
Probability
Determination of quantity performances of the parametric reliability for unique objects, 7:31914 (FEI—1126)
Productivity
Guide for prioritizing power plant productivity improvement projects: modification and simplification of the DOE/MRI methodology, 7:31902 (ORNL/SUB—7435/1)
Guide for prioritizing power plant productivity improvement projects: handbook of availability improvement methodology, 7:31903 (ORNL/Sub—7435/2)
Radioactive Effluents
Statement of the Strahlenschutzkommission concerning a comparison between population exposures due to radioactive emissions from coal-fired and nuclear power plants, 7:32494
Reactor Components
Flow-induced vibration design guidelines, 1981, 7:32060
Fluidelastic vibration of cylinder arrays in axial and cross flow--state of the art, 7:31988
Structural considerations and findings from testing of nuclear components (symposium), 1981, 7:32010
Reactor Cooling Systems
Summary of ASME Section XI pump and valve testing program for nuclear power plants and an assessment of its effect on plant availability, 7:32059
Reactor Materials
Long-life fatigue of type 316 stainless steel of temperatures up to 593 C, 7:31986
Reactor Safety
Flow-induced vibration design guidelines, 1981, 7:32060
Size effect related to damping caused by water submersion, 7:32053

Reliability
Guide for prioritizing power plant productivity improvement projects: modification and simplification of the DOE/MRI methodology, 7:31902 (ORNL/SUB—7435/1)
Guide for prioritizing power plant productivity improvement projects: handbook of availability improvement methodology, 7:31903 (ORNL/Sub—7435/2)
Risk Assessment
Foundation of the technique for assessment of radiation consequences of nuclear power plant accidents, 7:32537 (IAE—3144)
Risk analysis and acceptance by the public of large power stations, 7:32539
Seismic Effects
Current topics in piping and pipe support design (symposium), 1981, 7:32061
Size effect related to damping caused by water submersion, 7:32053
Shock Absorbers
Electro-mechanical snubber proposal, 7:31987
Site Selection
Environmental, legal and political constraints on power plant siting in the southwestern United States. Special Series 16, 7:31911 (NP—2902471)
Socio-Economic Factors
Environmental, legal and political constraints on power plant siting in the southwestern United States. Special Series 16, 7:31911 (NP—2902471)
Valves
Summary of ASME Section XI pump and valve testing program for nuclear power plants and an assessment of its effect on plant availability, 7:32059

NUCLEAR REACTIONS
See also HADRON REACTIONS
PHOTONUCLEAR REACTIONS
Meetings
Workshop report of nuclear physics to be studied by NUMATRON accelerator, 7:32762 (INS-NUMA—18)

NUCLEAR REACTORS
See REACTORS

NUCLEAR STRUCTURE
Research Programs
Research in experimental nuclear physics. Progress report, April 1, 1981-March 31, 1982, 7:32761 (DOE/ER/05224—5)
Spectral Shift
Isotope shifts in unstable nuclei, 7:32781 (KFK—2974)

NUCLEAR WASTES
See RADIOACTIVE WASTES

NUCLEAR WEAPON TESTS
See NUCLEAR EXPLOSIONS

NUCLEAR WEAPONS
Psychology
Psychology of the nuclear balance, 7:32471

NUCLEIC ACIDS
See also DNA
RNA
Molecular Structure
Synchrotron radiation sources for photobiology and ultraviolet, visible and infrared spectroscopy, 7:32424

NUCLEON-NUCLEON INTERACTIONS
See also PROTON-PROTON INTERACTIONS
Nucleon-nucleon theory and phenomenology. Progress report and renewal proposal, 7:32723 (DOE/ER/10516—10)

NUCLEONS
See also NEUTRONS
PROTONS
Particle Decay
Detection of the nucleon decays by the calorimeter composed of the neon flash chambers, 7:32438
Structure Functions
Structure functions in deep inelastic lepton nucleon scattering, 7:32731 (SLAC—245)

O

OAK RIDGE NATIONAL LABORATORY
See ORNL

OAK RIDGE RESEARCH REACTOR
See ORR REACTOR

OBESITY
See METABOLIC DISEASES

OFF-GAS SYSTEMS
Evaporative Cooling
New look at evaporative gas cooling and conditioning in the cement industry, 7:32312

OFF-PEAK ENERGY STORAGE
Sodium-Sulfur Batteries
Advanced-battery electrochemical-process development. Final report, 7:32071 (NYSERDA—80-36)

OFFSHORE PLATFORMS
Capital
Steel in offshore structures, 7:31752
Material Substitution
Steel in offshore structures, 7:31752
Materials
Steel in offshore structures, 7:31752
Oil Wells
Lessons from major accidents, 7:32051

OHIO STATE UNIVERSITY REACTOR
See OSUR REACTOR

OIL BURNERS
Fuel Substitution
Final test report on the combustion of solvent-refined coal in a 100 hp firetube boiler, 7:31742 (DOE/PETC/TR—82/5)

OIL SHALE DEPOSITS
In-Situ Retorting
Evaporation of in-situ oil-shale-retort water, 7:31776 (PNL-SA—9805)
Resource Assessment
Oil-yield resources for oil-shale sequences in core from the Piceance Creek Basin, Colorado, that average 10, 15, 20, 25, 30, 35, and 40 gallons per ton. Data file, 7:31772 (PB—82-134883)

OIL SHALES
See also BLACK SHALES
Fischer Assay
Oil-shale Fischer assay analysis from selected coreholes in the Piceance Creek Basin, Colorado. Data file, 7:31774 (PB—82-134875)

OIL SPILL FINGERPRINTING
See OIL SPILLS

OIL SPILLS
Forecasting
Assessment of synfuel spill cleanup options, 7:31730 (PNL-SA—9806)

OIL WELLS
Comparative Evaluations
Lessons from major accidents, 7:32051
Fires
Lessons from major accidents, 7:32051

OKLAHOMA
Severance Tax
Severance taxes on coal and uranium in the sunbelt, 7:31745

OLEFINS
See ALKENES

OPERATIONAL AMPLIFIERS
Design
300° quad operational amplifier, 7:32468 (SAND—82-0425)
Performance
300° quad operational amplifier, 7:32468 (SAND—82-0425)

OPTICAL EQUIPMENT
Machining
Motion control system for the Large Optics Diamond Turning Machine (LODTM), 7:32254 (UCRL—86438)

OPTICAL SYSTEMS
Antireflection Coatings
Coatings for laser fusion, 7:32903 (UCRL—87037)

ORDNANCE
Performance
TAAMM submunition project. Monthly progress report No. 8, July 1-31, 1979, 7:32469 (UCID—18253)
ORE PROCESSING
See also MILL TAILINGS
Industrial Medicine
Radioactivity in former workers at a thorium refinery, 7:32580
ORGANIC COMPOUNDS
See also ALDEHYDES
AMINES
KETONES
NUCLEIC ACIDS
ORGANIC HALOGEN COMPOUNDS
ORGANIC PHOSPHORUS COMPOUNDS
PROTEINS
Electron-Positron Interactions
Study of photoexcited states by positron method. Final report, 7:32697 (DOE/EV/04500—2)
Excited States
Study of photoexcited states by positron method. Final report, 7:32697 (DOE/EV/04500—2)
ORGANIC FLUORINE COMPOUNDS
See also FLUORINATED ALICYCLIC HYDROCARBONS
FLUORINATED ALIPHATIC HYDROCARBONS
Electron Spin Resonance
Electron paramagnetic resonance and crystal structure study of bis(triphenylphosphine)iminium hexafluorouranate(V), 7:32239
Lattice Parameters
Electron paramagnetic resonance and crystal structure study of bis(triphenylphosphine)iminium hexafluorouranate(V), 7:32239
ORGANIC HALOGEN COMPOUNDS
See also HALOGENATED ALIPHATIC HYDROCARBONS
ORGANIC FLUORINE COMPOUNDS
Photolysis
Studies in chemical reactivity. Progress report, November 30, 1980-1 December 1981, 7:32222 (DOE/ER/02026—41)
ORGANIC PHOSPHORUS COMPOUNDS
See also HDEHP
NUCLEIC ACIDS
Electron Spin Resonance
Electron paramagnetic resonance and crystal structure study of bis(triphenylphosphine)iminium hexafluorouranate(V), 7:32239
Lattice Parameters
Electron paramagnetic resonance and crystal structure study of bis(triphenylphosphine)iminium hexafluorouranate(V), 7:32239
ORNL
(Oak Ridge National Laboratory.)
Radiation Monitoring
Development of monitoring programs for ERDA owned radioactive low-level waste burial sites. Final report, 7:31816 (DOE/EV/03759—T1)
ORNL RESEARCH REACTOR
See ORR REACTOR
ORNL-PCA REACTOR
Reactor Operation
Bulk Shielding Facility. Quarterly report, October-December 1980, 7:32005 (ORNL/TM—7978)
Bulk Shielding Facility quarterly report, April, May, and June 1981, 7:32007 (ORNL/TM—8029)
Bulk shielding facility quarterly report, July, August, and September 1980, 7:32004 (ORNL/TM—7841)
ORR REACTOR
Reactor Operation
Oak Ridge research reactor. Quarterly report, January, February, and March 1981, 7:32006 (ORNL/TM—7979)
ORTHOGONAL TRANSFORMATIONS
Many-Dimensional Calculations
Numerical generation of orthomonic polynomials of many variables, 7:32915 (JINR—E-11-80-782)
OSMIUM
Foam Separation
Concentration of trace elements from Cheleken peninsula thermal brines by means of foam flotation, 7:32195 (JINR—6-81-75)
OSMIUM 187 TARGET
Neutron Reactions
Parameters of osmium neutron resonances in 6 - 60 eV range, 7:32783 (JINR-R—3-81-19)
OSMIUM 189 TARGET
Neutron Reactions
Parameters of osmium neutron resonances in 6 - 60 eV range, 7:32783 (JINR-R—3-81-19)
OSMIUM COMPLEXES
Catalytic Effects
Integrated approach to the systematic synthesis, characterization, and catalytic activity of novel heterogeneous catalysts. Final progress report, 7:32206 (DOE/ER/10381—3)
OSUR REACTOR
Reactor Operation
Ohio State University Reactor Sharing Program. Semi-annual technical report, September 1, 1980-April 30, 1981, 7:31998 (DOE/ER/10727—T1)
OVARIES
Scintiscanning
Use of hormone receptors in scintigraphy of the ovaries, 7:32556
OVERHEAD POWER TRANSMISSION
Electrical Faults
Calculation of the load from short circuit currents in high-voltage systems with non-bunched conductor cables, 7:31912 (NP—2901106)
OXYGEN
Ion-Atom Collisions
Reactions of ions with atomic and molecular free radicals. Progress report, May 1, 1981-April 30, 1982 (Summaries of research activities at the University of Minnesota), 7:32693 (DOE/ER/02640—13)
Mass Transfer
Measurement of bubble size distributions in fermentation media using a photoelectric probe, 7:32464
Photon-Atom Collisions
Photoionization of atoms. Final report, April 1, 1976-March 30, 1981, 7:32695 (DOE/ER/02892—30)
Synergism
Pathogenetic mechanism in lung fibrosis (Mice), 7:32585
OXYGEN 16 REACTIONS
Fusion Reactions
Low angular-momentum-cutoff in statistical heavy-ion processes, 7:32768 (IFUSP-P—244)
Total Cross Sections
Contribution of quasi-elastic processes to the total reaction cross-section of heavy ions, 7:32769 (IFUSP-P—249)
OXYGEN EFFECT (RADIOBIOLOGY)
See OXYGEN
OXYGEN IONS
Backscattering
Observation of surface dissociation of HgTe crystal by means of 42MeV-O^{5+} backscattering, 7:32717
OXYGEN METERS
Performance Testing
Electrochemical cell for measuring oxygen activity in liquid sodium, 7:31945 (FEI—1061)
OZONE LAYER
Nuclear Explosions
Should we trust models or observations (Effects of supersonic transport and atmospheric nuclear tests on the ozone layer), 7:32483
Supersonic Transport
Should we trust models or observations (Effects of supersonic transport and atmospheric nuclear tests on the ozone layer), 7:32483

P

PACIFIC GAS DIABLO CANYON-1 REACTOR
See DIABLO CANYON-1 REACTOR

PACIFIC NORTHWEST REGION
See also WASHINGTON
Biomass
Pacific Northwest biomass as an energy resource, 7:31850 (PNL-SA—9982)
PAINTS
Absorptivity
Solar-absorber-selective paint research, 7:31879 (LA-UR—81-3610)
Emissivity
Solar-absorber-selective paint research, 7:31879 (LA-UR—81-3610)
Surface Coating
Solar-absorber-selective paint research, 7:31879 (LA-UR—81-3610)
PAIRING INTERACTIONS
Collective Model
Interacting sp-boson model with isospin: an unified description of giant multipole resonances and other collective motions, 7:32797 (IFUSP-P—240)
Interacting Boson Model
Equations of motion for nuclear particle-particle excitations and the interacting boson model, 7:32788 (IFUSP-P—245)
PALLADIUM
Catalytic Effects
Methane and methanol synthesis over supported palladium catalysts, 7:31830
PARABOLIC REFLECTORS
Construction
Solar concentrators, 7:31880 (PB—82-157553)
PARAFFINS
See ALKANES
PASSIVE SOLAR HEATING SYSTEMS
Feasibility Studies
Passive solar retrofit study for the United States Navy, 7:31869 (LA—9071-MS)
Latent Heat Storage
Analysis of selected surface characteristics and latent heat storage for passive solar space heating, 7:31866 (BNL—30441)
Performance
Analysis of selected surface characteristics and latent heat storage for passive solar space heating, 7:31866 (BNL—30441)
Retrofitting
Passive solar retrofit study for the United States Navy, 7:31869 (LA—9071-MS)
Solar Absorbers
Analysis of selected surface characteristics and latent heat storage for passive solar space heating, 7:31866 (BNL—30441)
PCA-ORNL REACTOR
See ORNL-PCA REACTOR
PEAT
Combustion
Potential for use of peat blends with coal for electric power generation, 7:31743
PEOPLE
See HUMAN POPULATIONS
PEP STORAGE RINGS
(Positron-electron-proton storage ring.)
Performance
Design constraints and limitations in e^+e^- storage rings, 7:32363 (SLAC—245)
Research Programs
Early results from the MKII detector at PEP, 7:32366 (SLAC—245)
PEPR DEVICES
See CATHODE RAY TUBE DIGITIZERS
PERSONNEL
See also REACTOR OPERATORS
Delayed Radiation Effects
Radioactivity in former workers at a thorium refinery, 7:32580
Epidemiology
Multivariate methods for assessing disease/environment association: conceptual versus geographic regions, 7:32569
PERSONNEL MONITORING
Design principles for radiological protection instrumentation systems, 7:32367 (AECP—8(Pt.2))
Environmental surveillance plan for the Department of Energy's Niagara Falls Storage Site (NFSS), Lewiston, New York, 7:31797 (NLCO—008EV)
PERTECHNETATES
Adsorption
Adsorption of technetium on selected inorganic ion-exchange materials and on a range of naturally occurring minerals under oxic conditions, 7:32244
PESTICIDES
See also HERBICIDES
Ecological Concentration
Situation and analysis of residues in milk, 7:32499
PETRA STORAGE RING
Research Programs
Recent e^+e^- results from PETRA, 7:32365 (SLAC—245)
PETROLEUM DEPOSITS
Exploration
Twelfth annual Appalachian Petroleum Geology Symposium. Appalachian thrust belt/tight sands/shale gas. Circular No. C-20, 7:31749 (CONF-8103124—Absts)
PETROLEUM DISTILLATES
Chemical Analysis
Fuel oil distributor's experience with contaminated No. 2 fuel oil, 7:31759
Contamination
Fuel oil distributor's experience with contaminated No. 2 fuel oil, 7:31759
PETROLEUM GEOLOGY
Synthesis of hydrocarbons in the earth's crust, 7:31750 (LA—8983)
PETROLEUM INDUSTRY
Economic Impact
Mineral oil and employment. Jobs in the West German mineral oil industry and its secondary industries, 7:31753 (NP—2901054)
Employment
Mineral oil and employment. Jobs in the West German mineral oil industry and its secondary industries, 7:31753 (NP—2901054)
Investment
Investment requirements in the energy sector and their financing, 7:32097 (NP—2901055)
Legislation
1980 Legal Report of Oil and Gas Conservation Activities, 7:31754 (NP—2901180)
PH VALUE
Hourly Variations
Design and preliminary results of the intermediate density precipitation chemistry experiment, 7:32482
Spatial Distribution
Design and preliminary results of the intermediate density precipitation chemistry experiment, 7:32482
PHAGES
See BACTERIOPHAGES
PHARMACOLOGY
Daily Variations
Chronopharmacology of L-DOPA: implications for orthochronal therapy in the prevention of circadian dyschronism, 7:32568
PHARMACOTHERAPY
See CHEMOTHERAPY
PHENYLETHYLENE
See STYRENE
PHOSPHORYLASES
See PHOSPHOTRANSFERASES
PHOSPHOTRANSFERASES
Radioimmunoassay
Distribution of cyclic-GMP-dependent protein kinase in various rat tissues and cell lines determined by a sensitive and specific radioimmunoassay, 7:32549

Tissue Distribution
Distribution of cyclic-GMP-dependent protein kinase in various rat tissues and cell lines determined by a sensitive and specific radioimmunoassay, 7:32549
PHOTODISINTEGRATION
See PHOTONUCLEAR REACTIONS
PHOTOMULTIPLIERS
Gamma Detection
Experimental study of specific fluorescence features of organic scintillators during their interactions with fast neutrons and gamma-quanta, 7:32372 (FEI—1099)
Neutron Detection
Experimental study of specific fluorescence features of organic scintillators during their interactions with fast neutrons and gamma-quanta, 7:32372 (FEI—1099)
Scintillation Quenching
Experimental study of specific fluorescence features of organic scintillators during their interactions with fast neutrons and gamma-quanta, 7:32372 (FEI—1099)
PHOTON ACTIVATION ANALYSIS
See ACTIVATION ANALYSIS
PHOTON DETECTION (X-RAY)
See X-RAY DETECTION
PHOTON-ATOM COLLISIONS
Excitation
Photoionization of helium to He^+ (n = 2), 7:32694 (DOE/ER/02892—29)
Ionization
Photoionization of helium to He^+ (n = 2), 7:32694 (DOE/ER/02892—29)
PHOTON-NUCLEON INTERACTIONS
Recoils
Development and performance of a high pressure hydrogen time projection chamber, 7:32369 (DOE/ER/40033—13)
PHOTON-PHOTON INTERACTIONS
Photoproduction
Pion pair production in photon-photon collisions at spear, 7:32732
PHOTONUCLEAR REACTIONS
Elastic Scattering
Elastic scattering of monochromatic photons at the atomic nucleus of ^{208}Pb in and above the dipole giant resonance, 7:32789 (INIS-mf—6825)
Resonance Absorption
Interference effects in Moessbauer spectra of M1-transitions (^{83}Kr, ^{119}Sn, ^{129}I, ^{149}Sm, ^{151}Eu, ^{169}Tm, ^{183}W, ^{193}Ir, ^{197}Au), 7:32772 (IAE—3313/1)
Resonance Scattering
Resonance scattering of 3-5 MeV γ-quanta emitted at radioactive decay, 7:32786 (JINR-R—15-81-151)
PHOTOSYNTHESIS
Mathematical Models
Reduction of photosynthetically active radiation under extreme stratospheric-aerosol loads, 7:32474 (LA-UR—81-3573)
PHOTOVOLTAIC POWER SUPPLIES
Bibliographies
Bibliography of reports by the Sandia photovoltaic projects, 7:31858 (SAND—81-0135-Rev.1)
Computerized Simulation
Photovoltaics and electric utilities, 7:31834 (SAND—81-7027)
Cost Benefit Analysis
Normative price for energy from an electricity-generation system: an owner-dependent methodology for energy generation (system) assessment (OMEGA). Volume II. Derivation of system energy price equations, 7:31856 (DOE/ET/20356—5)
Lead-Acid Batteries
Application, sizing, testing and performance of the photovoltaic battery subsystem at Natural Bridges National Monument, Utah, 7:31855 (DOE/ET/20279—153)
Marketing Research
Photovoltaics and electric utilities, 7:31834 (SAND—81-7027)
Performance
Intermediate photovoltaic system application experiment operational performance report. Volume 4 for Mt. Laguna Radar Station, Mt. Laguna, CA, 7:31860 (SAND—81-7090/4)
Intermediate photovoltaic system application experiment operational performance report. Volume 5. Newman Power Station Site, El Paso, TX, 7:31859 (SAND—81-7086/5)
Power Conditioning Circuits
Investigation of a family of power conditioners integrated into the utility grid: Category 1. Residential power conditioner. Final report, 7:31857 (DOE/ET/29310—1)
Values
Photovoltaics and electric utilities, 7:31834 (SAND—81-7027)
Valves
Normative price for energy from an electricity-generation system: an owner-dependent methodology for energy generation (system) assessment (OMEGA). Volume II. Derivation of system energy price equations, 7:31856 (DOE/ET/20356—5)
PHYSICAL RADIATION EFFECTS
Research Programs
Physics of radiation damage and radiation material science, 7:32815 (KFTI—80-48)
PHYTOPLANKTON
Population Dynamics
Biological processes in the water column of the South Atlantic Bight. Progress report, 7:32603 (DOE/EV/00936—T3)
PICEANCE CREEK BASIN
Oil-yield resources for oil-shale sequences in core from the Piceance Creek Basin, Colorado, that average 10, 15, 20, 25, 30, 35, and 40 gallons per ton. Data file, 7:31772 (PB—82-134883)
PICKET FENCE
See CUSPED GEOMETRIES
PION MINUS REACTIONS
Charge-Exchange Reactions
Research in experimental nuclear physics. Progress report, April 1, 1981-March 31, 1982, 7:32761 (DOE/ER/05224—5)
PION PLUS REACTIONS
Charge-Exchange Reactions
Research in experimental nuclear physics. Progress report, April 1, 1981-March 31, 1982, 7:32761 (DOE/ER/05224—5)
PION REACTIONS
Elastic Scattering
Research in experimental nuclear physics. Progress report, April 1, 1981-March 31, 1982, 7:32761 (DOE/ER/05224—5)
Inelastic Scattering
Research in experimental nuclear physics. Progress report, April 1, 1981-March 31, 1982, 7:32761 (DOE/ER/05224—5)
PION-NUCLEON INTERACTIONS
Psi Resonances
Pion production of chi mesons, 7:32746 (SLAC—245)
PIONS
See also PIONS MINUS
PIONS PLUS
Particle Production
Generation and scaling behaviour of high-energy pions in relativistic heavy ion reactions, 7:32798 (INIS-mf—6798)
PIONS MINUS
Pair Production
Pion pair production in photon-photon collisions at spear, 7:32732
PIONS PLUS
Pair Production
Pion pair production in photon-photon collisions at spear, 7:32732
PIPELINES
Cathodic Protection
Fault detection and potential measurements with buried pipes, 7:32259
Coatings
Fault detection and potential measurements with buried pipes, 7:32259
PIPES
Acoustic Testing
Sound monitoring for detection of pipe ruptures, 7:32283 (Juel-Spez—88)
Burnout
Determination of critical boiling conditions within the whol steam content range for internal pipe flow, 7:32278

Corrosion Fatigue
Qualification of induction heating stress improvement for mitigation of stress corrosion cracking (BWR), 7:32047
Crack Propagation
3-D finite element analysis for the investigation of feedwater line cracking in PWR steam generators, 7:32050
Dynamic Loads
Evaluation of dynamic load combination fatigue damage, 7:32048
Fatigue
Evaluation of dynamic load combination fatigue damage, 7:32048
Mechanical Vibrations
Experimental benchmark for piping system dynamic response analyses (LMFBR), 7:31953
Ruptures
Sound monitoring for detection of pipe ruptures, 7:32283 (Juel-Spez—88)
Stress Analysis
Evaluation of dynamic load combination fatigue damage, 7:32048
Experimental benchmark for piping system dynamic response analyses (LMFBR), 7:31953
Stress Corrosion
Qualification of induction heating stress improvement for mitigation of stress corrosion cracking (BWR), 7:32047
Supports
Dynamic analysis techniques--a sensitivity study for piping systems at a nuclear power plant, 7:32065
Evaluation of pipe support stiffness and its effect on piping response, 7:32064
Generic methods for design of small-bore pipe supports, 7:32063

PIXE ANALYSIS
Effect of elastically scattered protons on the energy resolution of x-ray detectors in PIXE measurements, 7:32420 (PEL—277)

PLANTS
See also FUNGI
Radionuclide Migration
Requirements for a practical assessment of transfer and concentration factors in plants, 7:32516 (INIS-mf—6902)
Transfer of Sr and Cs into vegetation through the roots, 7:32508 (INIS-mf—6902)
Tritium uptake by plants, 7:32506 (INIS-mf—6902)
Root Absorption
Transfer of Sr and Cs into vegetation through the roots, 7:32508 (INIS-mf—6902)

PLANTS (INDUSTRIAL)
See INDUSTRIAL PLANTS

PLANTS (POWER)
See POWER PLANTS

PLASMA
See also COLD PLASMA
HIGH-BETA PLASMA
HOT PLASMA
LASER-PRODUCED PLASMA
SOLID-STATE PLASMA
General and nuclear physics, 7:32874 (KFTI—80-37)
Control Systems
Feedback controller of ultra high pressure gas, 7:32870 (IPPJ-DT—82)
Ion-Atom Collisions
Proceedings of the Nagoya seminar on atomic processes in fusion plasmas, 7:32702 (IPPJ-AM—13)

PLASMA DIAGNOSTICS
Meetings
Proceedings of USSR-Japan joint seminar on plasma diagnostics Nov. 13, 1979 through Nov. 17, 1979, 7:32857 (IPPJ—438)

PLASMA INSTABILITY
See also PLASMA MACROINSTABILITIES
PLASMA MICROINSTABILITIES
Stabilization
Stabilization of a vertical instability by a feedback system at the T-12 installation, 7:32852 (IAE—3268/7)

PLASMA MACROINSTABILITIES
See also KINK INSTABILITY
TEARING INSTABILITY
TRAPPED-PARTICLE INSTABILITY
Computational studies of tokamak plasmas, 7:32873 (JAERI-M—9354)
Analytical Solution
Stability of low-frequency modes in tandem mirrors and bumpy tori, 7:32877 (SAI—254-81-387-LJ)

PLASMA MICROINSTABILITIES
Relation between Weibel instability and magnetic field generating thermal instability, 7:32867 (IPPJ—485)
Plasma Simulation
Computer simulation on microinstabilities and anomalous resistivity near the magnetic neutral sheet, 7:32869 (IPPJ—487)

PLASTIC SCINTILLATION DETECTORS
Plastic wall scintillator detector array, 7:32383 (GSI—81-2)
Program controlled system for measuring and monitoring the electron coherent radiation spectrum of Yerevan synchrotron, 7:32370 (EFI—398(5)-80)
Efficiency
Modified version of the Monte Carlo computer code for calculating neutron detection efficiencies, 7:32391 (IFUSP-P—250)
Simulation of neutron detection process in modular detectors, 7:32371 (EFI—401(8)-80)
Neutron Detection
Simulation of neutron detection process in modular detectors, 7:32371 (EFI—401(8)-80)

PLASTIC SCINTILLATORS
Sensitivity
Neutron detector for detecting rare events of spontaneous fission, 7:32411 (JINR-R—13-81-18)
Spontaneous Fission
Neutron detector for detecting rare events of spontaneous fission, 7:32411 (JINR-R—13-81-18)

PLATINUM
Catalytic Effects
Hydrogenolysis of carbon and its catalysis by platinum, 7:31722
Chemical Reactions
Germanide formation by thermal treatment of platinum films deposited on single-crystal Ge<100> substrates, 7:32426
Foam Separation
Concentration of trace elements from Cheleken peninsula thermal brines by means of foam flotation, 7:32195 (JINR—6-81-75)
Vapor Deposited Coatings
Germanide formation by thermal treatment of platinum films deposited on single-crystal Ge<100> substrates, 7:32426

PLATINUM 187
Energy Levels
Nuclear chemistry research and spectroscopy with radioactive sources. Seventeenth annual progress report, 7:32787 (DOE/ER/03346—T1)

PLUMES
Diffusion
Mathematical modelling of the atmospheric distribution of cooling tower plumes, 7:32495
Mathematical Models
Mathematical modelling of the atmospheric distribution of cooling tower plumes, 7:32495

PLUTONIUM
Diagrams
Work diagram for plutonium, 7:32245
Free Enthalpy
Work diagram for plutonium, 7:32245
Radionuclide Migration
Supplement to the paper 'Transfer of plutonium, americium, and curium from ground to vegetation through plant roots', 7:32513 (INIS-mf—6902)
Transfer of plutonium, americium, and curium from ground to vegetation through plant roots, 7:32512 (INIS-mf—6902)
Retention
Deposition and retention of plutonium in the United States general population, 7:32577

Root Absorption
Supplement to the paper 'Transfer of plutonium, americium, and curium from ground to vegetation through plant roots', 7:32513 (INIS-mf—6902)
Transfer of plutonium, americium, and curium from ground to vegetation through plant roots, 7:32512 (INIS-mf—6902)
Self-Diffusion
Model of diffusion of metals. 2. Effect of polymorphic transformations on self-diffusion parameters, 7:32232 (FEI—1094)
Sputtering
Target sputtering by multicharged heavy ion beams, 7:32711 (RI—120)
Tissue Distribution
Plutonium microdistribution in human bone, 7:32581

PLUTONIUM 238
Biological Localization
In vivo measurement of actinides in the human lung, 7:32579

PLUTONIUM 239
Biological Localization
In vivo measurement of actinides in the human lung, 7:32579
Carcinogenesis
Pulmonary tumours in Syrian hamsters following inhalation of $^{239}PuO_2$, 7:32573
Dosimetry
Calibration of phoswich detectors for assessment of plutonium in lungs: the methods of four laboratories compared, 7:32823
Excretion
Late excretion of plutonium following acquisition of known amounts, 7:32576
Gamma Spectroscopy
In situ subterranean determination of actinides by high-resolution gamma-ray spectrometry, 7:31817 (PNL-SA—8992)
Inhalation
Pulmonary tumours in Syrian hamsters following inhalation of $^{239}PuO_2$, 7:32573

PLUTONIUM 239 TARGET
Sample Preparation
Preparation of thin targets of ^{239}Pu, ^{233}U and ^{235}U by the method of electrospraying, 7:32228 (AAEC/E—512)

PLUTONIUM 241
Gamma Spectroscopy
In situ subterranean determination of actinides by high-resolution gamma-ray spectrometry, 7:31817 (PNL-SA—8992)

PLUTONIUM 242
Radiochemical Analysis
Determination of americium and plutonium in autopsy tissue: methods and problems, 7:32578

PLUTONIUM CARBIDES
Swelling
Investigations on swelling of U-PU mixed carbide, 7:32173 (KFK—3078)

PLUTONIUM DIOXIDE
Carcinogenesis
Pulmonary tumours in Syrian hamsters following inhalation of $^{239}PuO_2$, 7:32573
Inhalation
Pulmonary tumours in Syrian hamsters following inhalation of $^{239}PuO_2$, 7:32573

PLUTONIUM HYDRIDES
Moessbauer Effect
Moessbauer effect studies of Npsub(x)Pusub(1-x) (0.15<=x<=1) dihydrides, 7:32700 (IA—1364)

PLUTONIUM NITRATES
Polymerization
Polymerization of Pu(IV) in aqueous nitric acid solutions, 7:32241

PNA
See POLYCYCLIC AROMATIC HYDROCARBONS

POINT CONTACTS
See ELECTRIC CONTACTS

POINT POLLUTANT SOURCES
Data Analysis
Application of factor analysis to urban aerosol source resolution, 7:32490

POISEUILLE FLOW
See LAMINAR FLOW

POLLUTION ABATEMENT
Government Policies
Environmental Issues Briefing Book sections concerning water quality and solid waste regulatory issues impacting DOE plans and programs, 7:32080 (DOE/EV/10025—T1)

POLLUTION CONTROL EQUIPMENT
Research Programs
Trade-offs in NO/sub x/ control, 7:32311
Technology Transfer
Trade-offs in NO/sub x/ control, 7:32311

POLLUTION REGULATIONS
Economic Impact
Economic-impact study of proposed IPCB amendments to water-pollution regulations, R80-6. Document No. 82/06, 7:32096 (NP—2903327)

POLONIUM 201
Electron Capture Decay
Nuclear chemistry research and spectroscopy with radioactive sources. Seventeenth annual progress report, 7:32787 (DOE/ER/03346—T1)

POLONIUM 210
Radionuclide Migration
Ground/plant transfer factors of Ra-226, Po-210, and Pb-210, 7:32515 (INIS-mf—6902)

POLYACETALS
Crystal Models
Polarons in polyacetylene, 7:32836 (LA-UR—81-3590)
Polarons
Polarons in polyacetylene, 7:32836 (LA-UR—81-3590)

POLYCYCLIC AROMATIC HYDROCARBONS
Qualitative Chemical Analysis
Comparison of several methods for collection and quantification of polycyclic aromatic hydrocarbons from aqueous media, 7:32530

POLYETHERS
See POLYETHYLENE GLYCOLS

POLYETHYLENE GLYCOLS
Synergism
Crown ethers as size-selective synergists in solvent extraction systems: a new selectivity parameter, 7:32218

POLYMERS
See also ELASTOMERS
Physical Radiation Effects
High-level waste immobilization program. Quarterly report, October-December 1979, 7:31800 (PNL-SA—8408)

POLYOLEFINS
See also POLYSTYRENE
Lattice Field Theory
Polyacetylene: a real material linking condensed matter and field theory, 7:32754 (LA-UR—81-3636)
Statistical Mechanics
Polyacetylene: a real material linking condensed matter and field theory, 7:32754 (LA-UR—81-3636)

POLYSTYRENE
Fluorescence
Contribution of electronically excited states to the radiation chemistry of organic systems. Progress report, September 1, 1980-November 30, 1981, 7:32221 (DOE/ER/00913—2)

POOL CRITICAL ASSEMBLY ORNL
See ORNL-PCA REACTOR

POPULATION RELOCATION
Mathematical Models
Simplified evacuation model for estimating mitigation of early population exposures, 7:32572 (PNL-SA—9133)

POROSITY
Potentiometry
Potentiometric determination of percent porosity in nickel electroplates on uranium metal, 7:32161 (Y/DW—282)

POSITION SENSITIVE DETECTORS
Efficiency
Pressurised position sensitive detector for gamma detection, 7:32413 (JINR-R—13-81-298)

Gamma Detection
Pressurised position sensitive detector for gamma detection, 7:32413 (JINR-R—13-81-298)

POSITRONIUM
Study of photoexcited states by positron method. Final report, 7:32697 (DOE/EV/04500—2)

POTASSIUM
Erosion
Suppression of sputter-induced erosion rate from alkali covered metal surface, 7:32909
Leaching
Trace element characterization of coal wastes. Fifth annual progress report, October 1, 1979-September 30, 1980, 7:31728 (LA—8826-PR)
Sputtering
Suppression of sputter-induced erosion rate from alkali covered metal surface, 7:32909

POTASSIUM 43
Radionuclide Kinetics
Differences between ^{201}TI and ^{43}K tissue distribution in rested and exercised rats, 7:32575

POTASSIUM CARBONATES
Chemical Preparation
Conversion of alkali metal sulfate to the carbonate (Patent), 7:32213
Separation Processes
Conversion of alkali metal sulfate to the carbonate (Patent), 7:32213

POTASSIUM CHLORIDES
Orthorhombic Lattices
Polytypism in $KMnCl_3$. Neutron diffraction study of the distorted perovskite structure compound, 7:32208 (IA—1364)

POTASSIUM SULFATES
Conversion
Conversion of alkali metal sulfate to the carbonate (Patent), 7:32213

POTENTIOMETRY
Potentiometric determination of percent porosity in nickel electroplates on uranium metal, 7:32161 (Y/DW—282)

POWER CONDITIONING CIRCUITS
Design
Investigation of a family of power conditioners integrated into the utility grid: Category 1. Residential power conditioner. Final report, 7:31857 (DOE/ET/29310—1)
Equipment Interfaces
Investigation of a family of power conditioners integrated into the utility grid: Category 1. Residential power conditioner. Final report, 7:31857 (DOE/ET/29310—1)

POWER GENERATION
Research Programs
New connections for new technologies, 7:32085

POWER PLANTS
See also MHD POWER PLANTS
THERMAL POWER PLANTS
WIND POWER PLANTS
Maintenance
Multi state simulation model of the maintenance for a power generating station, 7:31904 (SV-FUD—4-2)
Materials
Limiting factors in the calculation of depletion under creep stress conditions (Additional Component depletion due to variations in temperature and stresses above design conditions), 7:31908
Reliability
Multi state simulation model of the maintenance for a power generating station, 7:31904 (SV-FUD—4-2)
Repair
Multi state simulation model of the maintenance for a power generating station, 7:31904 (SV-FUD—4-2)

POWER POOLS
See INTERCONNECTED POWER SYSTEMS

POWER REACTORS
See also CLINCH RIVER BREEDER REACTOR
DIABLO CANYON-1 REACTOR
EBR-2 REACTOR
KORI-1 REACTOR
LAMPRE-1 REACTOR
MIHAMA-1 REACTOR
MUELHEIM-KAERLICH REACTOR
PROCESS HEAT REACTORS
THREE MILE ISLAND-2 REACTOR
VK-50 REACTOR
WWER-2 REACTOR
Containment Buildings
Modeling turbine-missile impacts using the HONDO finite-element code, 7:32033 (SAND—80-2627)
Reactor Cores
CARDIOGRAMA: a stochastic, semi-empirical methodology for power-reactor surveillance and diagnostics, 7:31959 (CONF-811103—68)
Reactor Kinetics
CARDIOGRAMA: a stochastic, semi-empirical methodology for power-reactor surveillance and diagnostics, 7:31959 (CONF-811103—68)

POWER SYSTEMS
See also INTERCONNECTED POWER SYSTEMS
Simulation
Simulation methods for systems analysis in electric power supply, 7:32101 (NP—2901089)

POWER TRANSMISSION
See also OVERHEAD POWER TRANSMISSION
Research Programs
New connections for new technologies, 7:32085

POWER TRANSMISSION LINES
Electrical Faults
Calculation of the load from short circuit currents in high-voltage systems with non-bunched conductor cables, 7:31912 (NP—2901106)

PRASEODYMIUM
Self-Diffusion
Model of diffusion of metals. 2. Effect of polymorphic transformations on self-diffusion parameters, 7:32232 (FEI—1094)

PRASEODYMIUM ALLOYS
Magnetic Susceptibility
Induced magnetism via conduction electron exchange; application to $PrAl_2$, 7:32134 (CBPF-A—0021/80)

PRASEODYMIUM IONS
Magnetic Susceptibility
Magnetic behavior of Van Vleck ions and an electron gas interacting by exchange, 7:32692 (CBPF-A—0007/80)

PRESSURE DROP
Measuring Methods
Heat transfer and pressure drop at single rods with three-dimensional roughnesses. Large scale tests, 7:32274 (KFK—3164)
Heat transfer and pressure drop at single pins with three-dimensional roughnesses, 7:32275 (KFK—3165)

PRESSURE RELEASE
Valves
Recent research at MIT on fluid-structure interactions, chugging, and scaling laws for SRV discharges, 7:32027 (GKSS—81/E/27)

PRESSURE SUPPRESSION
A Codes
Multi-vent effects on the dynamic pressure caused by chugging, 7:32024 (GKSS—81/E/27)
Fluid-Structure Interactions
Analysis of fluid-structure interaction in pressure suppression systems type 69 during steam condensation, 7:32026 (GKSS—81/E/27)
Modal analysis of the GKSS-PSS-wet well, 7:32028 (GKSS—81/E/27)
Recent research at MIT on fluid-structure interactions, chugging, and scaling laws for SRV discharges, 7:32027 (GKSS—81/E/27)
Mathematical Models
Multi-vent system problems, 7:32023 (GKSS—81/E/27)
Mockup
Analysis of pressure oscillations and pressure spikes in the Marviken pressure suppression containment, 7:32025 (GKSS—81/E/27)
Research Programs
State of JAERI Full-Scale Mark II CRT Program, 7:32020 (GKSS—81/E/27)

State of pressure suppression containment research in the Federal Republic of Germany, 7:32019 (GKSS—81/E/27)
Simulation
Mark III Confirmation Test Program, 7:32021 (GKSS—81/E/27)
Multi-vent system problems, 7:32023 (GKSS—81/E/27)
Review of GKSS 3-vent experimental program and results, 7:32022 (GKSS—81/E/27)

PRESSURE VESSELS
Acoustic Emission Testing
Usefulness of energy measurements in industrial applications of acoustic emission, 7:32288
Fatigue
Monitoring of nuclear power plant reactor vessel thermal transients and fatigue usage factors, 7:32046
Hydrostatics
Usefulness of energy measurements in industrial applications of acoustic emission, 7:32288
Meetings
Analysis of the behavior of advanced reactor pressure vessel steels under neutron irradiation. IAEA co-ordinated research programme, 7:32153 (IWGRRPC—79/4)
Physical Radiation Effects
Curve fitting and uncertainty analysis of Charpy impact data (PWR; BWR), 7:31916 (NUREG/CR—2408)
Pressure Gradients
Method for coupled three-dimensional analysis of reactor vessel blowdowns with internal structures (PWR), 7:32054
Stress Analysis
Method for coupled three-dimensional analysis of reactor vessel blowdowns with internal structures (PWR), 7:32054

PRESSURIZED WATER REACTORS
See PWR TYPE REACTORS

PRESTRESSED CONCRETE
Simulation
Experimental analysis of a nuclear reactor prestressed concrete pressure vessels model, 7:31983 (INIS-mf—6770)

PRICES
Forecasting
Price forecasting in DOE's short-term integrated forecasting system, 7:32077

PRIMARY COOLANT CIRCUITS
Nozzles
Holographic investigation of nonequilibrium vapor generation in a two-dimensional nozzle (PWR; BWR), 7:32016 (EGG-M—02381)

PRIMARY COSMIC RADIATION
Inclusive Interactions
Critical evaluation of the single particle inclusive cross sections used for describing particle production in high energy cosmic ray interactions, 7:32751
Origin
Satellite observation of cosmic ray air showers, 7:32610

PROCESS HEAT REACTORS
Reactor Licensing
Safety/licensing assessment of the 1170-MW(t) HTGR process heat plant, 7:32018 (GA-A—16467)
Reactor Safety
Safety/licensing assessment of the 1170-MW(t) HTGR process heat plant, 7:32018 (GA-A—16467)
Risk Assessment
Safety/licensing assessment of the 1170-MW(t) HTGR process heat plant, 7:32018 (GA-A—16467)

PROCESS SOLUTIONS
Chemical Analysis
Chemical/biological characterization of SRC-II product and by-products, 7:31747 (PNL-SA—8813)
Mutagen Screening
Chemical/biological characterization of SRC-II product and by-products, 7:31747 (PNL-SA—8813)
Mutagenesis
Sunlight activation of shale-oil byproducts as measured by genotoxic effects in cultured Chinese hamster cells, 7:32587 (LA-UR—81-3204)
Radioactivation
Sunlight activation of shale-oil byproducts as measured by genotoxic effects in cultured Chinese hamster cells, 7:32587 (LA-UR—81-3204)
Toxicity
Sunlight activation of shale-oil byproducts as measured by genotoxic effects in cultured Chinese hamster cells, 7:32587 (LA-UR—81-3204)

PROCESSING (ORES)
See ORE PROCESSING

PROCESSING (WASTES)
See WASTE PROCESSING

PROJECTION SPARK CHAMBERS
Performance
Development and performance of a high pressure hydrogen time projection chamber, 7:32369 (DOE/ER/40033—13)

PROJECTORS (SCANNING)
See SCANNING MEASURING PROJECTORS

PROMETHAZINE
See AMINES

PROPANE
Combustion
Coupling of transport and chemical processes in catalytic combustion. Final report, 7:32305 (DOE/MC/14036—T1)

1,2,3-PROPANETRIOL
See GLYCEROL

PROPANOLS
Adsorption
Photoelectron spectroscopy of methyl, ethyl and isopropyl alcohol adsorbed on the (110) surface of Cu, 7:32713
Photoelectron Spectroscopy
Photoelectron spectroscopy of methyl, ethyl and isopropyl alcohol adsorbed on the (110) surface of Cu, 7:32713

PROPANONE
See ACETONE

PROPENE
See PROPYLENE

PROPORTIONAL COUNTERS
See also HE-3 COUNTERS
Coincidence Methods
Particle detector for multi-parameter coincidence measurements in atomic physics, 7:32379 (GSI—81-2)

PROPYLENE
Ion-Molecule Collisions
Study of the ion-molecule reaction in a microwave plasma of propylene, 7:32701 (IA—1364)
Polymerization
Study of the ion-molecule reaction in a microwave plasma of propylene, 7:32701 (IA—1364)

PROTECTION (RADIATION)
See RADIATION PROTECTION

PROTEINS
See also HISTONES
Molecular Structure
Synchrotron radiation sources for photobiology and ultraviolet, visible and infrared spectroscopy, 7:32424
Quantitative Chemical Analysis
T4 head assembly and high temperature, 7:32565

PROTON CHANNELING
Fokker-Planck Equation
Fokker-Planck equation for the description of thermalization of beams of energetic charged particle channeled through a crystal, 7:32707 (JINR-R—17-80-814)

PROTON REACTIONS
Study on the neutron yield from thick targets under the action of 645 MeV protons, 7:32766 (JINR—18-80-540)
Capture
Intermediate structure in proton resonances, 7:32771 (JINR-R—15-80-786)
Pickup Reactions
Direct experimental evidence for strong sequential two-step transfer process in allowed (p,t) reactions, 7:32782 (UTTAC—38)
Strong sequential transfer processes in $O^+ \rightarrow O^+$ (p,t) reactions on Pb isotopes, 7:32791 (UTTAC—39)

PROTON-ANTIPROTON INTERACTIONS
Exotic Resonances
Measurement of total cross-section of antiproton-proton reaction in the momentum range between 400 and 700 MeV/c, 7:32727 (KEK—79-33)
Total Cross Sections
Measurement of total cross-section of antiproton-proton reaction in the momentum range between 400 and 700 MeV/c, 7:32727 (KEK—79-33)
PROTON-NUCLEON INTERACTIONS
See also PROTON-PROTON INTERACTIONS
Research Programs
Experiments using the TASS and HISS spectrometers at the Bevalac. Annual progress report, April 1, 1981-March 31, 1982, 7:32604 (DOE/ER/04699—7)
PROTON-PROTON INTERACTIONS
Weak Interactions
Present experiments at KEK 12 GeV PS, 7:32726 (KEK—79-33)
PROTONS
Particle Decay
Is the proton stable, 7:32736
KEK: (UT)^3 experiment on proton decay, 7:32734
Structure Functions
Structure functions in deep inelastic lepton nucleon scattering, 7:32731 (SLAC—245)
PSI RESONANCES
Scintillation Counters
Recent results from the crystal ball, 7:32357 (SLAC—245)
PSYCHOLOGY
See BEHAVIOR
PSYCHOSES
See MENTAL DISORDERS
PUBLIC UTILITIES
See also ELECTRIC UTILITIES
Statistics
Public supply utilities in 1976 and 1977 in figures, 7:32076 (NP—2901082)
PULSARS
Neutrinos
Binary system as a hidden source of high energy neutrinos, 7:32683
PULSE ANALYZERS
See also MULTI-CHANNEL ANALYZERS
On-Line Measurement Systems
Improvements to the multi on-line analysis system, 7:32377 (GSI—81-2)
PULSE DISCRIMINATORS
Electronic Circuits
Simplified constant fraction discriminator circuit for application in multichannel discriminators, 7:32376 (GSI—81-2)
PUSAN KORI-1 REACTOR
See KORI-1 REACTOR
PWR TYPE REACTORS
See also DIABLO CANYON-1 REACTOR
KORI-1 REACTOR
MIHAMA-1 REACTOR
MUELHEIM-KAERLICH REACTOR
THREE MILE ISLAND-2 REACTOR
WWER-2 REACTOR
Fluid-structure interaction--a survey with emphasis on its application to nuclear steam system design, 7:31932
ECCS
Experimental study of safety injection and reflooding, 7:32032 (KAERI/RR—231/80)
Failed Element Detection
Improvement of failed fuel detection system of light water reactor, 7:31925 (KAERI/RR—226/80)
Fluid Mechanics
Normal modes of a coupled fluid-shell system, 7:31933
Fuel Assemblies
Calculated neutron-source spectra from selected irradiated PWR fuel assemblies, 7:31928 (LA—9125-MS)
Fuel Cycle
Assessment of nonbackfittable concepts for improving uranium utilization in LWRs, 7:31918 (PNL-SA—9100)
Coastdown in light water reactors as a fuel management strategy, 7:31920 (INIS-mf—6753)
Fuel Element Clusters
Fabrication of PWR fuel assembly and CANDU fuel bundle, 7:31926 (KAERI/RR—243/80)
Fuel Element Failure
Improvement of failed fuel detection system of light water reactor, 7:31925 (KAERI/RR—226/80)
Fuel Elements
Nuclear design and analysis for PWR, 7:31923 (KAERI/RR—223/80)
Fuel Management
Coastdown in light water reactors as a fuel management strategy, 7:31920 (INIS-mf—6753)
Nuclear design and analysis for PWR, 7:31923 (KAERI/RR—223/80)
Fuel Rods
High burnup PWR ramp test program. First semi-annual progress report, October 1980-March 1981, 7:32014 (DOE/ET/34030—1)
Fuel-Cladding Interactions
High burnup PWR ramp test program. First semi-annual progress report, October 1980-March 1981, 7:32014 (DOE/ET/34030—1)
Heat Transfer
Interactive fluid-structural dynamic problems in power engineering, presented at the joint conference of the pressure vessels and piping, materials, nuclear engineering, solar energy divisions, 1981, 7:32052
Hydrodynamics
Interactive fluid-structural dynamic problems in power engineering, presented at the joint conference of the pressure vessels and piping, materials, nuclear engineering, solar energy divisions, 1981, 7:32052
Normal modes of a coupled fluid-shell system, 7:31933
In-Service Inspection
Recent experience in inservice examinations, 7:31930
Loss of Coolant
Evaluation of incompressible hydrodynamic mass methods in reactor applications, 7:32056
Experimental study of safety injection and reflooding, 7:32032 (KAERI/RR—231/80)
Holographic investigation of nonequilibrium vapor generation in a two-dimensional nozzle, 7:32016 (EGG-M—02381)
LFTPLT8: plotter program for RELAP5 code, 7:32029 (JAERI-M—9359)
Method for coupled three-dimensional analysis of reactor vessel blowdowns with internal structures, 7:32054
Transient deformation properties of Zircaloy for LOCA simulation. Final report, 7:32017 (EPRI-NP—526-Vol.4,Pt.2)
Virtual mass calculation for loss-of-coolant-accident analysis of a pressurized water reactor, 7:32057
Pressure Vessels
Curve fitting and uncertainty analysis of Charpy impact data, 7:31916 (NUREG/CR—2408)
Method for coupled three-dimensional analysis of reactor vessel blowdowns with internal structures, 7:32054
Primary Coolant Circuits
Holographic investigation of nonequilibrium vapor generation in a two-dimensional nozzle, 7:32016 (EGG-M—02381)
Radioactive Wastes
Graphical and tabular summaries of decay characteristics for once-through PWR, LMFBR, and FFTF fuel cycle materials (Spent fuel, high-level waste fuel can scrap), 7:31956 (ORNL/TM—8061)
Reactor Components
Flow induced vibration in the design of nuclear components, 7:31919
Reactor Cores
Assessment of nonbackfittable concepts for improving uranium utilization in LWRs, 7:31918 (PNL-SA—9100)
Nuclear design and analysis for PWR, 7:31923 (KAERI/RR—223/80)
Reactor Instrumentation
Advanced two-phase instrumentation program. Quarterly progress report, July-September 1981, 7:31929 (NUREG/CR—2204-Vol.3)

Reactor Materials
Transient deformation properties of Zircaloy for LOCA simulation. Final report, 7:32017 (EPRI-NP—526-Vol.4,Pt.2)
Reactor Safety Experiments
Evaluation of incompressible hydrodynamic mass methods in reactor applications, 7:32056
Virtual mass calculation for loss-of-coolant-accident analysis of a pressurized water reactor, 7:32057
Steam Generators
3-D finite element analysis for the investigation of feedwater line cracking in PWR steam generators, 7:32050
Computer intelligence design for automatic inspection of steam generator tubes, 7:31931

PYRIDAZINES
Excited States
Convergence problems and energetic regions in π excited states of certain conjugated molecules, 7:32691 (CBPF-A—0005/80)

PYRIDINE
Solvent Properties
Macromolecular structural changes in bituminous coals during extraction and solubilization. Quarterly technical progress report, 1 September 1981-1 December 1981, 7:31724 (DOE/PC/30222—T2)

Q

QUADRUPOLE LINACS
Proton model of a heavy-ion RFQ accelerator, 7:32320 (GSI—81-2)
Beam Optics
Octupole focusing in transport and acceleration systems, 7:32326 (LA-UR—81-3058)
Cavity Resonators
Mechanical design of RFQ resonator cavities in the 400-MHz frequency range, 7:32325 (LA-UR—81-3057)
Multipoles
Octupole focusing in transport and acceleration systems, 7:32326 (LA-UR—81-3058)

QUALITY ASSURANCE
Legal Aspects
Quality assurance through jurisdiction, 7:32286

QUANTUM CHROMODYNAMICS
Jet Model
Untangling jets from hadronic final states, 7:32744 (SLAC—245)
Lattice Field Theory
Recent results in lattice gauge theories, 7:32757 (SLAC—245)

QUANTUM FLAVORDYNAMICS
Flavor dynamics, 7:32753 (KEK—79-33)

QUARK MODEL
Lattice Field Theory
Phase transitions and elementary-particle physics, 7:32752 (BNL—30432)

QUARK-ANTIQUARK INTERACTIONS
Bound State
QCD and heavy quark atoms, 7:32748 (SLAC—245)
Cross Sections
Experiments using the TASS and HISS spectrometers at the Bevalac. Annual progress report, April 1, 1981-March 31, 1982, 7:32604 (DOE/ER/04699—7)
Experiment Planning
Experiments using the TASS and HISS spectrometers at the Bevalac. Annual progress report, April 1, 1981-March 31, 1982, 7:32604 (DOE/ER/04699—7)

QUARKS
Bound State
Heavy flavor production from photons and hadrons, 7:32745 (SLAC—245)
Quark-antiquark bound state spectroscopy and QCD, 7:32755 (SLAC—245)
Electric Charges
Free quark search at PEP, 7:32749 (SLAC—245)
Excited States
Research in theoretical physics. Annual progress report, April 1, 1981-March 31, 1982 (Preon models), 7:32738 (DOE/ER/03285—41)
Mass
Flavor dynamics, 7:32753 (KEK—79-33)
Particle Structure
Composite quarks and leptons, 7:32759 (SLAC—245)

QUINONE
See BENZOQUINONES

R

RADAR
See also RADIO EQUIPMENT
Energy Consumption
Energy use in three sectors of the electrical-engineering industry, 7:32123
Manufacturing
Energy use in three sectors of the electrical-engineering industry, 7:32123
Photovoltaic Power Supplies
Intermediate photovoltaic system application experiment operational performance report. Volume 4 for Mt. Laguna Radar Station, Mt. Laguna, CA, 7:31860 (SAND—81-7090/4)

RADIATION CHEMISTRY
Research Programs
Contribution of electronically excited states to the radiation chemistry of organic systems. Progress report, September 1, 1980-November 30, 1981, 7:32221 (DOE/ER/00913—2)

RADIATION DAMAGE (NONBIOLOGIC)
See RADIATION EFFECTS

RADIATION DETECTORS
See also BEAM MONITORS
CHERENKOV COUNTERS
GAMMA CAMERAS
GEIGER-MUELLER COUNTERS
HODOSCOPES
NEUTRON DETECTORS
POSITION SENSITIVE DETECTORS
PROPORTIONAL COUNTERS
RADIOMETERS
SCINTILLATION COUNTERS
SHOWER COUNTERS
SPECTROMETERS
Counting Rates
In vivo measurement of uranium in the human chest under high background conditions, 7:32419 (PEL—275)
Influence of radiation detector dead time upon count rate statistics, 7:32441
Dead Time
Influence of radiation detector dead time upon count rate statistics, 7:32441
Gamma Detection
In vivo measurement of uranium in the human chest under high background conditions, 7:32419 (PEL—275)
Gases
Gas mixtures for gas-filled radiation detectors (Patent), 7:32423
Helium-Neon Lasers
Laser application for detector system adjustment in a reaction chamber, 7:32416 (KIYI—80-8)
Holography
Laser application for detector system adjustment in a reaction chamber, 7:32416 (KIYI—80-8)
Low Level Counting
Statistical aspects of the interpretation of counting experiments designed to detect low levels of radioactivity, 7:32418 (NRPB-R—113)
Personnel Monitoring
Design principles for radiological protection instrumentation systems, 7:32367 (AECP—8(Pt.2))

PIXE Analysis
Effect of elastically scattered protons on the energy resolution of x-ray detectors in PIXE measurements, 7:32420 (PEL—277)
Recommendations
Design principles for radiological protection instrumentation systems, 7:32367 (AECP—8(Pt.2))
X-Ray Detection
Effect of elastically scattered protons on the energy resolution of x-ray detectors in PIXE measurements, 7:32420 (PEL—277)
RADIATION DOSEMETERS
See DOSEMETERS
RADIATION DOSIMETRY
See DOSIMETRY
RADIATION EFFECTS
See also PHYSICAL RADIATION EFFECTS
Meetings
Proceedings of the 7. Bakurianian school on radiation physics of metals and alloys, 7:32152 (INIS-SU—61)
RADIATION HYGIENE
See RADIATION PROTECTION
RADIATION PROTECTION
Meetings
Problems on dosimetry and radiation protection. No. 19, 7:32822 (INIS-SU—39)
RADIATION SAFETY
See RADIATION PROTECTION
RADIATION TRANSPORT
See also NEUTRON TRANSPORT
Transport processes in slabs bounded by reflectors, 7:32816 (USC—113P19-77)
RADIO EQUIPMENT
See also RF SYSTEMS
Energy Consumption
Energy use in three sectors of the electrical-engineering industry, 7:32123
Manufacturing
Energy use in three sectors of the electrical-engineering industry, 7:32123
RADIO RECEIVERS
See RADIO EQUIPMENT
RADIO TRANSMITTERS
See RADIO EQUIPMENT
RADIOACTIVE BIOLOGICAL WASTES
See RADIOACTIVE WASTES
RADIOACTIVE EFFLUENTS
See also RADIOACTIVE WASTES
Environmental Impacts
Natural radioactivity in the production of titanium dioxide pigment: a study of the Laporte Plant and environment behaviour of radionuclides at Bunbury, Western Australia, 7:32504 (ARL/TR—037)
RADIOACTIVE WASTE DISPOSAL
See also SHAFT EXCAVATIONS
Bench-Scale Experiments
Effect of organic complexants on the mobility of low level waste radionuclides in soils, 7:31805 (PNL-SA—10019)
Comparative Evaluations
Environmental effects of reactor waste disposal alternatives, 7:31801 (PNL-SA—8604)
Environmental Impacts
Environmental effects of reactor waste disposal alternatives, 7:31801 (PNL-SA—8604)
Ground Disposal
Radionuclide ground-water monitoring program for the separations area, Hanford Site, Washington State, 7:32534 (RHO-SA—216)
Hydraulic Fracturing
Site selection and investigation for subsurface disposal of radioactive wastes in hydraulically induced fractures, 7:31810 (USGS-OFR—80-450)
Intermediate-Level Radioactive Wastes
Site selection and investigation for subsurface disposal of radioactive wastes in hydraulically induced fractures, 7:31810 (USGS-OFR—80-450)
Low-Level Radioactive Wastes
Radionuclide ground-water monitoring program for the separations area, Hanford Site, Washington State, 7:32534 (RHO-SA—216)
Marine Disposal
Castable ceramics for hydrothermal environments: materials evaluation for the In-Situ Heat Transfer Experiment, 7:31809 (SAND—81-1882)
Submergible barge retrievable storage and permanent disposal system for radioactive waste (Patent), 7:31812
Mill Tailings
Use of controlled release herbicides in waste burial sites, 7:31818 (PNL-SA—9503)
Radionuclide Migration
Effect of organic complexants on the mobility of low level waste radionuclides in soils, 7:31805 (PNL-SA—10019)
Site Selection
Site selection and investigation for subsurface disposal of radioactive wastes in hydraulically induced fractures, 7:31810 (USGS-OFR—80-450)
Test Facilities
Numerical prediction of basalt response for near-surface test facility heater tests No. 1 and No. 2, 7:31806 (RHO-BWI-C—86)
Underground Disposal
Site selection and investigation for subsurface disposal of radioactive wastes in hydraulically induced fractures, 7:31810 (USGS-OFR—80-450)
RADIOACTIVE WASTE FACILITIES
Radiation Monitoring
Development of monitoring programs for ERDA owned radioactive low-level waste burial sites. Final report, 7:31816 (DOE/EV/03759—T1)
Sensitivity Analysis
Assessment of effectiveness of geologic isolation systems. Radionuclide-transport sensitivity studies, 7:31802 (PNL-SA—8927)
RADIOACTIVE WASTE MANAGEMENT
See also RADIOACTIVE WASTE STORAGE
Bibliographies
Low-level radioactive wastes. A bibliography of additions to the Energy Data Base in 1981, 7:31793 (DOE/TIC—3387)
Information Systems
Solid Waste Information Management System (SWIMS). Data summary, Fiscal Year 1980, 7:31794 (DOE/TIC—2005250)
Low-Level Radioactive Wastes
Low-level radioactive wastes. A bibliography of additions to the Energy Data Base in 1981, 7:31793 (DOE/TIC—3387)
RADIOACTIVE WASTE PROCESSING
Agglomeration
Liquid-waste immobilization by agglomeration, 7:31804 (PNL-SA—9739)
Combustion
Mound cyclone incinerator. Volume I. Description and performance, 7:31796 (MLM-MU—81-72-0003-Vol.1)
Gelation
Study of droplet formation for preparation of spheres by internal gelation, 7:31799 (ORNL/MIT—337)
High-Level Radioactive Wastes
Review of multibarrier waste from development, 7:31803 (PNL-SA—9440)
Research Programs
High-level waste immobilization program. Quarterly report, October-December 1979, 7:31800 (PNL-SA—8408)
Solidification
High-level waste immobilization program. Quarterly report, October-December 1979, 7:31800 (PNL-SA—8408)
Liquid-waste immobilization by agglomeration, 7:31804 (PNL-SA—9739)
RADIOACTIVE WASTE STORAGE
Barges
Submergible barge retrievable storage and permanent disposal system for radioactive waste (Patent), 7:31812
Heat Transfer
Mixed convection in rectangular channel flow with smooth surfaces and one heated wall, 7:31814

Low-Level Radioactive Wastes
Environmental surveillance plan for the Department of Energy's Niagara Falls Storage Site (NFSS), Lewiston, New York, 7:31797 (NLCO—008EV)
Personnel Monitoring
Environmental surveillance plan for the Department of Energy's Niagara Falls Storage Site (NFSS), Lewiston, New York, 7:31797 (NLCO—008EV)
Planning
Storage of low-level radioactive waste: a potential West Virginia alternative. Circular No. C-21, 7:31798 (NP—2902483)
Radiation Monitoring
Environmental surveillance plan for the Department of Energy's Niagara Falls Storage Site (NFSS), Lewiston, New York, 7:31797 (NLCO—008EV)
Research Programs
Research and development related to the Nevada Nuclear Waste Storage Investigations. Progress report, April 1-June 30, 1981, 7:31795 (LA—8959-PR)
Underground Storage
Storage of low-level radioactive waste: a potential West Virginia alternative. Circular No. C-21, 7:31798 (NP—2902483)
Wet powder seal for gas containment (Patent), 7:31811

RADIOACTIVE WASTES
See also ALPHA-BEARING WASTES
CALCINED WASTES
HIGH-LEVEL RADIOACTIVE WASTES
LOW-LEVEL RADIOACTIVE WASTES
RADIOACTIVE EFFLUENTS
Leaching
Solubility limits of importance to leaching, 7:32535
Radioactivity
Graphical and tabular summaries of decay characteristics for once-through PWR, LMFBR, and FFTF fuel cycle materials (Spent fuel, high-level waste fuel can scrap), 7:31956 (ORNL/TM—8061)
Residual Power
Graphical and tabular summaries of decay characteristics for once-through PWR, LMFBR, and FFTF fuel cycle materials (Spent fuel, high-level waste fuel can scrap), 7:31956 (ORNL/TM—8061)
Toxicity
Graphical and tabular summaries of decay characteristics for once-through PWR, LMFBR, and FFTF fuel cycle materials (Spent fuel, high-level waste fuel can scrap), 7:31956 (ORNL/TM—8061)
Water Removal
Hot air drum evaporator (Patent), 7:31813

RADIOCARBON DATING
See CARBON 14

RADIOECOLOGY
Functional Models
Characteristics and accuracy of calculation models, 7:32520 (INIS-mf—6902)

RADIOFREQUENCY SYSTEMS
See RF SYSTEMS

RADIOGRAPHY (INDUSTRIAL)
See INDUSTRIAL RADIOGRAPHY

RADIOIMMUNOASSAY
Data Analysis
Radioimmunoassay data processing (RIAPROG) - 4th edition. Software, 7:32547 (PB—82-121955)
Radioimmunoassay data processing (BASRIA). Software, 7:32548 (PB—82-121971)

RADIOISOTOPE MIGRATION
See RADIONUCLIDE MIGRATION

RADIOISOTOPES
Adsorption
Results of the separations area ground-water monitoring network for 1980, 7:31807 (RHO-LD—165)
Gamma Spectroscopy
Study on the radioisotope-identification, 7:32198 (KAERI/RR—244/80)
Quantitative Chemical Analysis
Development of chemical analysis techniques, 7:32197 (KAERI/RR—210/80)

RADIOMETERS
Display Devices
Optoelectronic display units - status and trends, 7:32460
Near Infrared Radiation
Teleradiometer for remote atmospheric sensing in near infrared spectr spectral region, 7:32398 (INIS-SU—60)

RADIONUCLIDE MIGRATION
(In environment.)
Research Programs
Guidelines for sampling of soils and vegetation in order to determine contamination, radiation burden in the vicinity of nuclear power plants, seepage, and transfer factors of radionuclides, 7:32517 (INIS-mf—6902)
Sensitivity Analysis
Assessment of effectiveness of geologic isolation systems. Radionuclide-transport sensitivity studies, 7:31802 (PNL-SA—8927)

RADIONUCLIDES
See RADIOISOTOPES

RADIOPHARMACEUTICALS
Biological Localization
Nature of technetium compounds. Pt. 1, 7:32558
Visualization of the liver with sup(99m)Tc-EHDP in thalassemia major, 7:32552
Chemical Preparation
Development of more efficacious Tc-99m organ imaging agents for use in nuclear medicine by analytical characterization of radiopharmaceutical mixtures. Progress report, May 1, 1981-April 30, 1982, 7:32231 (DOE/EV/10380—2)
Distribution
Detection of abscesses and lymphosarcoma with ^{111}In-deferoxamine mesylate, 7:32563
Distribution in rats after intravenous injection of ^{88}Y compounds, 7:32564
Quality Control
Quantity control procedures for sup(99m)Ic complexes, 7:32560
Specifications
Quality assurance of radiopharmaceuticals-specifications and test procedures, 7:32229 (ARL/TR—034)
Testing
Quality assurance of radiopharmaceuticals-specifications and test procedures, 7:32229 (ARL/TR—034)
Tissue Distribution
Critical assessment of bone scan quantitation (bone to soft tissue ratios) in the diagnosis of metabolic bone disease, 7:32553

RADIOWAVE RADIATION
See also RADIO EQUIPMENT
Measuring Instruments
On-line phase and amplitude measurement of pulsed rf at 27 and 108 MHz, 7:32444 (GSI—81-2)

RADIUM 226
Radionuclide Migration
Ground/plant transfer factors of Ra-226, Po-210, and Pb-210, 7:32515 (INIS-mf—6902)

RADIUM 226 TARGET
Calcium 48 Reactions
Experiments on the fusion of element 108 in the ^{226}Ra+ ^{48}Ca reaction, 7:32792 (JINR-R—7-12054)

RAIN
See also ACID RAIN
Sampling
Design and preliminary results of the intermediate density precipitation chemistry experiment, 7:32482

RAMAN SPECTRA
Laser Spectroscopy
Application of metal vapor lasers to Raman spectroscopy for flame diagnostics, 7:32699 (IA—1364)

RARE EARTH ISOTOPES
Solubility
Solubility limits of importance to leaching, 7:32535

RARE GASES
See also ARGON
HELIUM
KRYPTON
NEON

XENON
Photon-Atom Collisions
Photoionization of atoms. Final report, April 1, 1976-March 30, 1981, 7:32695 (DOE/ER/02892—30)
REACTOR ACCIDENTS
See also FUEL ELEMENT FAILURE
LOSS OF COOLANT
Heat Transfer
Nonequilibrium vapor generation model for flashing flows, 7:32045
Two-Phase Flow
Nonequilibrium vapor generation model for flashing flows, 7:32045
REACTOR CELLS
Disadvantage Factor
One-group transport theory calculation for three slabs cells, 7:31993 (IEA-DT—148)
Eigenfunctions
One-group transport theory calculation for three slabs cells, 7:31993 (IEA-DT—148)
Multiplication Factors
To calculating plane cells by means of the $2P_0$-approximation, 7:31966 (FEI—1138)
Neutron Flux
Computer code for neutron group calculation of a cylindrical reactor cell (NEGR-Ts), 7:31969 (IAE—3377/5)
REACTOR CHARGING MACHINES
Nondestructive Testing
Nondestructive testing of steel lifting bands of the refueling machine of the nuclear ship OTTO HAHN using a special ultrasonic method, 7:32013
Quality Assurance
Nondestructive testing of steel lifting bands of the refueling machine of the nuclear ship OTTO HAHN using a special ultrasonic method, 7:32013
REACTOR COMPONENTS
See also FUEL ELEMENTS
REACTOR CHARGING MACHINES
REACTOR COOLING SYSTEMS
REACTOR CORES
Deformation
Progressive buckling. First series of experiments, 7:31977 (CEA-N—2213)
Version E2 from Dimco-System for the statistical calculation of components, 7:31984 (JEN—500)
Fracture Mechanics
Development of fracture mechanics and related techniques for evaluation of flaws detected during inservice inspection. Part 3, 7:31985 (KAERI/RR—221/80)
Fracture Properties
Development of fracture mechanics and related techniques for evaluation of flaws detected during inservice inspection. Part 3, 7:31985 (KAERI/RR—221/80)
Impact Strength
Dynamic crushing loads of thin-walled steel tubes, 7:31976 (AEEW-M—1830)
In-Service Inspection
Development of fracture mechanics and related techniques for evaluation of flaws detected during inservice inspection. Part 3, 7:31985 (KAERI/RR—221/80)
Mechanical Vibrations
Flow-induced vibration design guidelines, 1981, 7:32060
Flow induced vibration in the design of nuclear components (PWR;BWR), 7:31919
Flow-induced vibration testing scale modeling relations, 7:31989
Fluidelastic vibration of cylinder arrays in axial and cross flow--state of the art, 7:31988
Reflectivity
Calculations of the reflection and transmission of ultrasound by rough sodium-filled defects in steel (LMFBR), 7:31942 (AERE-R—10095)
Stress Analysis
Progressive buckling. First series of experiments, 7:31977 (CEA-N—2213)
Temperature Distribution
Program for calculating the temperature fields in constructive elements of nuclear reactors, 7:31979 (FEI—1019)
Thermal Stresses
Program for calculating the temperature fields in constructive elements of nuclear reactors, 7:31979 (FEI—1019)
Ultrasonic Testing
Calculations of the reflection and transmission of ultrasound by rough sodium-filled defects in steel (LMFBR), 7:31942 (AERE-R—10095)
REACTOR CONTROL THEORY
See REACTOR KINETICS
REACTOR COOLING SYSTEMS
See also PRIMARY COOLANT CIRCUITS
RHR SYSTEMS
Direct reactor auxiliary cooling system for the 1000-MWE LMFBR developmental plant, 7:32037
Heat Transfer
Semianalytical method of nonstationary thermal problem solution for a pipeline with an incompressible coolant (MLFBR), 7:31946 (IAE—3288/5)
In-Service Inspection
Summary of ASME Section XI pump and valve testing program for nuclear power plants and an assessment of its effect on plant availability, 7:32059
Two-Phase Flow
Inertial and damping properties of a two-phase mixture with surface-active agents, 7:31981 (FEI—1104)
REACTOR CORES
Nuclear design and analysis for PWR, 7:31923 (KAERI/RR—223/80)
Heat Transfer
Numerical technique for calculating coolant velocity and temperature fields in a nuclear reactor, 7:31980 (FEI—1100)
Hydraulics
Numerical technique for calculating coolant velocity and temperature fields in a nuclear reactor, 7:31980 (FEI—1100)
Modifications
Assessment of nonbackfittable concepts for improving uranium utilization in LWRs, 7:31918 (PNL-SA—9100)
Multiplication Factors
Ksub(eff) calculation by the variable separation method, 7:31963 (FEI—1079)
Power Density
CARDIOGRAMA: a stochastic, semi-empirical methodology for power-reactor surveillance and diagnostics, 7:31959 (CONF-811103—68)
Reactor Kinetics
Computer code for calculating reactor core optimal physical performances. POISK-2, 7:31965 (FEI—1110)
REACTOR FUEL ELEMENTS
See FUEL ELEMENTS
REACTOR INSTRUMENTATION
Densitometers
Advanced two-phase instrumentation program. Quarterly progress report, July-September 1981 (PWR), 7:31929 (NUREG/CR—2204-Vol.3)
Level Indicators
Advanced two-phase instrumentation program. Quarterly progress report, July-September 1981 (PWR), 7:31929 (NUREG/CR—2204-Vol.3)
REACTOR KINETICS
Benchmarks
Update and benchmark test of the LEOPARD library from ENDF/B-IV, 7:31974 (KAERI/RR—201/80)
Finite Difference Method
Derivation of the finite difference equations for a heterogeneous reactor. 1. Square lattice blocks, 7:31968 (IAE—3280/5)
Meetings
Reports of the Arbeitsgruppe Neutronenstreuung, 7:31967 (HMI-B—332)
Multigroup Theory
DIAMANT 2: a multigroup neutron-transport program for triangular and hexagonal geometry, 7:31975 (ORNL-tr—4797)

Neutron Flux
Quadratic approximation of the Payerls equation solution for multilayer cylinder. MKO program, 7:31970 (ITEF—162(1980))
Research Programs
Reports of the Arbeitsgruppe Neutronenstreuung, 7:31967 (HMI-B—332)
REACTOR LATTICES
Heterogeneous Effects
Derivation of the finite difference equations for a heterogeneous reactor. 1. Square lattice blocks, 7:31968 (IAE—3280/5)
Multiplication Factors
Test calculations of physical parameters of the TRX,BETTIS and MIT critical assemblies according to the TRIFON program, 7:31971 (ITEF—164(1980))
Neutron Flux
Test calculations of physical parameters of the TRX,BETTIS and MIT critical assemblies according to the TRIFON program, 7:31971 (ITEF—164(1980))
REACTOR MATERIALS
(See also specific materials.)
Creep
Transient deformation properties of Zircaloy for LOCA simulation. Final report, 7:32017 (EPRI-NP—526-Vol.4,Pt.2)
Deformation
Transient deformation properties of Zircaloy for LOCA simulation. Final report, 7:32017 (EPRI-NP—526-Vol.4,Pt.2)
Fatigue
Long-life fatigue of type 316 stainless steel of temperatures up to 593 C, 7:31986
Nondestructive Testing
Safety in nuclear engineering by means of nondestructive testing, 7:32042
Performance Testing
US/FRG umbrella agreement for cooperation in GCR development. Fuel, fission products, and graphite subprogram. Quarterly status report, July 1, 1981-September 30, 1981, 7:31937 (GA-A—16558)
Spectral Reflectance
Thermal radiation properties of ThO/sub 2/ in contact with sodium and steel (LMFBR), 7:31996
Surface Properties
Thermal radiation properties of ThO/sub 2/ in contact with sodium and steel (LMFBR), 7:31996
REACTOR OPERATORS
Education
Knowledge structures for process operators, 7:31954 (ERGONOMRAAD-R—18)
Simulator training analysis. A proposal for combined trainee debriefing and performance data collection, 7:31957 (RISO-M—2301)
Performance
Simulator training analysis. A proposal for combined trainee debriefing and performance data collection, 7:31957 (RISO-M—2301)
REACTOR PROTECTION SYSTEMS
Development of a self-actuated shutdown system (LMFBR), 7:32038
REACTOR SAFETY
(Theoretical and experimental investigations of the behavior of reactor types and designs under various real or hypothetical accidents.)
3-D finite element analysis for the investigation of feedwater line cracking in PWR steam generators, 7:32050
Comparison of LMFBR piping response obtained using response spectra and time history methods, 7:32049
Qualification of induction heating stress improvement for mitigation of stress corrosion cracking, 7:32047
Bibliographies
Nuclear Reactor Safety: a current awareness bulletin, 7:32015 (DOE/NRS—82/1)
REACTORS
See also EPITHERMAL REACTORS
POWER REACTORS
THERMAL REACTORS
WATER MODERATED REACTORS
Meetings
Reports of the Arbeitsgruppe Neutronenstreuung, 7:31967 (HMI-B—332)
Research Programs
Reports of the Arbeitsgruppe Neutronenstreuung, 7:31967 (HMI-B—332)
REAL TIME SYSTEMS
Data Base Management
Distributed resource management: deadlocks, 7:32913 (CONF-811214—6)
Programming
Applying structured analysis in a real-time data acquisition environment, 7:32928 (UCRL—86341)
RECYCLE (FUEL)
See FUEL CYCLE
RECYCLING
Management of soil systems for the disposal of industrial wastes, 7:32497 (DP-MS—81-72)
RECYCLING (FUEL)
See REPROCESSING
REFRIGERANTS
Thermal Degradation
Methods to avoid inadmissibly high final compression temperatures, 7:32258
REFUSE
See SOLID WASTES
REGION VI
See SOUTHWEST REGION
REGION X
See PACIFIC NORTHWEST REGION
REGULATORS (VOLTAGE)
See VOLTAGE REGULATORS
RELIABILITY
Standardized Terminology
State of the art of standardization of reliability terminology, 7:32299
REMOTE VIEWING EQUIPMENT
Design
High-temperature acoustic borehole televiewer, 7:31890 (SAND—82-0425)
RENEWABLE ENERGY SOURCES
See also BIOMASS
SOLAR ENERGY
WIND POWER
Commercialization
Report of the economic study panel of the inexhaustible resources study. Report No. CMU No. 1-53083, 7:32104 (DOE/ET/20091—1)
Demand Factors
Report of the economic study panel of the inexhaustible resources study. Report No. CMU No. 1-53083, 7:32104 (DOE/ET/20091—1)
Life-Cycle Cost
Analysis of life cycle costs of solar facilities, 7:32105 (LBL—13324)
REPROCESSING
Research Programs
Consolidated fuel reprocessing program. Progress report, July 1-September 30, 1981, 7:31789 (ORNL/TM—8030)
RESEARCH PROGRAMS
See also DEMONSTRATION PROGRAMS
International Cooperation
International cooperation in energy R & D, 7:32087
Standardization
Guidelines for sampling of soils and vegetation in order to determine contamination, radiation burden in the vicinity of nuclear power plants, seepage, and transfer factors of radionuclides, 7:32517 (INIS-mf—6902)
RESEARCH REACTORS
See also BSR-1 REACTOR
BSR-2 REACTOR
FFTF REACTOR
HFIR REACTOR
IBR-2 REACTOR
IBR-30 REACTOR
Neutron Flux
Some problems of the neutron flux increase in a fast research reactor, 7:32000 (FEI—1069)

RESIDENTIAL BUILDINGS
Solar Heating
Solar energy-utilization from the consumers' point of view. Report on a project to determine innovation trends and barriers, 7:31870 (NP—2900958)
RESIDENTIAL SECTOR
Electric Power
Growth of energy consumption and prices in the USA, FRG, France, and the UK, 1950-1979, 7:32110 (IIASA-WP—80-126)
Fuels
Growth of energy consumption and prices in the USA, FRG, France, and the UK, 1950-1979, 7:32110 (IIASA-WP—80-126)
Power Demand
User's guide to the data tapes from EPRI projects. Research projects 431-1 and 431-2, 7:32092 (EPRI-EA—235-Vol.3)
RESIDUES (RADIOACTIVE)
See RADIOACTIVE WASTES
RESISTORS
Technology Assessment
Thick film materials and discrete passive components, 7:32467 (SAND—82-0425)
Temperature Effects
Thick film materials and discrete passive components, 7:32467 (SAND—82-0425)
RESONANCE CAVITIES
See CAVITY RESONATORS
REVEGETATION
Cultivation Techniques
Guide for revegetating coal minesoils in the Eastern United States, 7:31729 (PB—81-245011)
Plants
Guide for revegetating coal minesoils in the Eastern United States, 7:31729 (PB—81-245011)
Recommendations
Guide for revegetating coal minesoils in the Eastern United States, 7:31729 (PB—81-245011)
RF SYSTEMS
See also RADIO EQUIPMENT
Oscillations
Parasitic oscillations and their suppression in the Alvarez final radio-frequency amplifiers, 7:32330 (GSI—81-2)
RHENIUM COMPLEXES
Catalytic Effects
Integrated approach to the systematic synthesis, characterization, and catalytic activity of novel heterogeneous catalysts. Final progress report, 7:32206 (DOE/ER/10381—3)
RHODIUM COMPLEXES
Catalytic Effects
Integrated approach to the systematic synthesis, characterization, and catalytic activity of novel heterogeneous catalysts. Final progress report, 7:32206 (DOE/ER/10381—3)
RHODIUM OXIDES
Catalytic Effects
Hydrogenation of carbon monoxide over rhodium oxide surfaces (At 250 to 350°C and 6 atm), 7:31827
RHR SYSTEMS
(Residual heat removal.)
Primary loop heat exchanger for HTGR plant residual heat removal and auxiliary cooling system, 7:32040
RIBONUCLEIC ACID
See RNA
RICHLAND FFTF REACTOR
See FFTF REACTOR
RINGS (STORAGE)
See STORAGE RINGS
RISER CRACKING
See COAL LIQUEFACTION
RISK ASSESSMENT
Recommendations
Foundation of the technique for assessment of radiation consequences of nuclear power plant accidents, 7:32537 (IAE—3144)
RIVERS
See also SUSQUEHANNA RIVER
Hydrology
General plan for hydrological conditions in the Isar River region. Vol. 2, 7:32598
General plan for hydrological conditions in the Isar River region. Vol. 1, 7:32599
Plan of the Isar River, 7:32600
Regional Analysis
General plan for hydrological conditions in the Isar River region. Vol. 2, 7:32598
General plan for hydrological conditions in the Isar River region. Vol. 1, 7:32599
Plan of the Isar River, 7:32600
RNA
(Ribonucleic acid.)
Hybridization
Regional gene mapping of human chromosomes purified by flow sorting, 7:32544
ROCK SALT
See SALT DEPOSITS
ROCKS
See also METAMORPHIC ROCKS
SYNTHETIC ROCKS
Activation Analysis
Methods of gold content determination in geological samples with the use of microtron resonance neutrons, 7:32196 (JINR—18-80-841)
ROCKY FLATS PLANT
Radiation Protection
Administrative practices to limit dose in environmental cleanup operations involving plutonium, 7:32505 (CONF-8110125—1)
RUBIDIUM CHLORIDES
Cubic Lattices
Polytypism in $RbMnCl_3$. Neutron diffraction study of the cubic perovskite structure compound, 7:32207 (IA—1364)
RUTHENIUM
Catalytic Effects
Studies of carbon monoxide hydrogenation over ruthenium using transient response techniques, 7:32217
Ion Exchange Chromatography
Chemistry of nitro complexes of nitrosylruthenium, 7:32194 (JAERI-M—9159)
Solvent Extraction
Chemistry of nitro complexes of nitrosylruthenium, 7:32194 (JAERI-M—9159)
RUTHENIUM COMPLEXES
Catalytic Effects
Integrated approach to the systematic synthesis, characterization, and catalytic activity of novel heterogeneous catalysts. Final progress report, 7:32206 (DOE/ER/10381—3)
RUTILE
Crystal-Phase Transformations
Metallic interaction in dioxides with rutile and rutile-related structures, 7:32233 (IA—1364)

S

SACCHARIDES
Molecular Structure
Synchrotron radiation sources for photobiology and ultraviolet, visible and infrared spectroscopy, 7:32424
SACCHAROMYCES CEREVISIAE
Enzyme Activity
Enzymatic hydrolysis of cellulose: theory and applications, 7:31829 (LBL—13669)
SAFEGUARDS
Research Programs
Nuclear safeguards research and development. Program status report, October 1980-January 1981, 7:31819 (LA—8870-PR)
SAFETY (NUCLEAR)
See RADIATION PROTECTION

SAFETY STANDARDS
International Cooperation
State of the art of standardization of reliability terminology, 7:32299
SALT DEPOSITS
Creep
Analysis of creep data for various natural rock salts, 7:32184 (SAND—81-2567)
SALYUT ORBITAL STATIONS
Radiometers
Teleradiometer for remote atmospheric sensing in near infrared spectr spectral region, 7:32398 (INIS-SU—60)
SAMARIUM
Electrochemistry
Electrochemical studies of trivalent californium and selected trivalent lanthanides in aqueous solutions, 7:32242
SAMARIUM 147 TARGET
Neutron Reactions
Study on the (n, α) reactions on ^{147}Sm, ^{149}Sm, ^{143}Nd isotopes at 2 keV neutron energy using Sc filtered beam, 7:32779 (JINR-R—3-80-779)
SAMARIUM 149 TARGET
Neutron Reactions
Study on the (n, α) reactions on ^{147}Sm, ^{149}Sm, ^{143}Nd isotopes at 2 keV neutron energy using Sc filtered beam, 7:32779 (JINR-R—3-80-779)
SARCOMAS
Diagnosis
Detection of abscesses and lymphosarcoma with ^{111}In-deferoxamine mesylate, 7:32563
SAVANNAH RIVER PLANT
Radiation Monitoring
Development of monitoring programs for ERDA owned radioactive low-level waste burial sites. Final report, 7:31816 (DOE/EV/03759—T1)
SCANDIUM 45 TARGET
Neutron Reactions
Evaluation of neutron nuclear data for ^{45}Sc, 7:32770 (NEANDC(J)—80/U)
SCANNING MEASURING PROJECTORS
Cathode Ray Tube Digitizers
Control algorithms for scanning device AELT-2/160. Pt. 1, 7:32452 (JINR-R—10-81-83)
Switching Circuits
Control algorithms for scanning device AELT-2/160. Pt. 1, 7:32452 (JINR-R—10-81-83)
SCINTIGRAPHY
See SCINTISCANNING
SCINTILLATION COUNTERS
See also LIQUID SCINTILLATION DETECTORS
SOLID SCINTILLATION DETECTORS
Calibration
Calibration of phoswich detectors for assessment of plutonium in lungs: the methods of four laboratories compared, 7:32823
SCINTISCANNING
Image Processing
Evaluation of image processing and presentation methods in thallium-201 myocardial scintigraphy, 7:32557
SCRAP METALS
Processing
Reducing energy cost in the Scrap Iron and Steel Industry, 7:32121 (DOE/CS/20295—1)
Recycling
Reducing energy cost in the Scrap Iron and Steel Industry, 7:32121 (DOE/CS/20295—1)
SEAWATER
Light Transmission
Technical assessment of the prevention of micro-fouling on OTEC heat-transfer surfaces through the use of ultraviolet radiation, 7:31865 (DOE/ET/21002—T21)
Sterilization
Technical assessment of the prevention of micro-fouling on OTEC heat-transfer surfaces through the use of ultraviolet radiation, 7:31865 (DOE/ET/21002—T21)
SEDIMENTS
Contamination
Sediments as criteria for water quality, 7:32529
Evaporation
Vaporization of sediments with a pulsed transverse excitation at atmospheric pressure (TEA) CO_2 laser system, 7:32204 (Y/DK—285)
Radiation Monitoring
Environmental surveillance plan for the Department of Energy's Niagara Falls Storage Site (NFSS), Lewiston, New York, 7:31797 (NLCO—008EV)
Spectroscopy
Vaporization of sediments with a pulsed transverse excitation at atmospheric pressure (TEA) CO_2 laser system, 7:32204 (Y/DK—285)
SEISMIC EFFECTS
Current topics in piping and pipe support design (symposium), 1981, 7:32061
SELENITES
Crystal Structure
^{2}D and ^{133}Cs NMR study of the hydrogen bond network and antiferroelectric phase transition of cesium trihydrogen selenite, 7:32214
Phase Transformations
^{2}D and ^{133}Cs NMR study of the hydrogen bond network and antiferroelectric phase transition of cesium trihydrogen selenite, 7:32214
SELENIUM
Leaching
Trace element characterization of coal wastes. Fifth annual progress report, October 1, 1979-September 30, 1980, 7:31728 (LA—8826-PR)
SELENIUM 75
Adsorption
Research and development related to the Nevada Nuclear Waste Storage Investigations. Progress report, April 1-June 30, 1981, 7:31795 (LA—8959-PR)
SEMICLASSICAL APPROXIMATION
Study of the relationship between the semi-classical and the generator coordinate methods, 7:32804 (IFUSP-P—241)
SEMICONDUCTOR DEVICES
Electric Contacts
Gallium phosphide devices, 7:31883 (SAND—82-0425)
Electron Density
Numerical simulation of semiconductor devices, 7:32304 (UIUCDCS-R—81-1072)
Mathematical Models
Numerical simulation of semiconductor devices, 7:32304 (UIUCDCS-R—81-1072)
SEMICONDUCTOR MATERIALS
(See also specific semiconductor materials.)
Ion Implantation
Defect formation in semiconductors under ion bombardment, 7:32809 (IAE—3261/11)
SENSIBLE HEAT STORAGE
Cost
Cost of heat from a seasonal source, 7:32067 (PNL-SA—9891)
SEWAGE TREATMENT
See WASTE PROCESSING
SHAFT EXCAVATIONS
See also RADIOACTIVE WASTE DISPOSAL
Drilling Equipment
New findings gained in blind shaft boring at the Zollverein mine, 7:31738 (DOE-tr—248)
Recent findings in the sinking of shafts using rod-less shaft boring machines, 7:31737 (DOE-tr—249)
Lining Processes
Recent findings in the sinking of shafts using rod-less shaft boring machines, 7:31737 (DOE-tr—249)
SHALE OIL
Refining
Stability of diesel fuels made from shale oil, 7:31775
Yields
Conversion of kerogen of Eastern US oil shale by tetralin and hydrogen, 7:31773 (CONF-820217—5)
SHEAR
Time Dependence
Dependence of vertical wind shear fluctuations on averaging times, 7:32475 (PNL-SA—8705)

SHEARER LOADERS
Dusts
Technical progress report No. 5, December 1-December 31, 1981, 7:31734 (FMA-BM—8148-81)
SHEATHS (FUEL)
See FUEL CANS
SHELLS
Elasticity
Nonlinear theory of elastic shells, 7:32250 (INIS-mf—6729)
Measuring Methods
Method and apparatus for determining diameter and wall thickness of minute hollow spherical shells (Patent), 7:32162
SHF RADIATION
See RADIOWAVE RADIATION
SHOCK ABSORBERS
Specifications
Electro-mechanical snubber proposal, 7:31987
Stress Analysis
Lateral loadings on snubber assemblies (BWR type reactor.), 7:32058
SHOCK (IMPACT)
See IMPACT SHOCK
SHORT CIRCUITS
See ELECTRICAL FAULTS
SHOWER COUNTERS
(Detects high energy gamma radiation or high energy particles on basis of cascade showers in layered absorbers.)
Detection of the nucleon decays by the calorimeter composed of the neon flash chambers, 7:32438
Evaluation of shower parameters by the moments method in hodoscope calorimeters, 7:32393 (IFVE-OEF—81-45)
Specifications
European hybrid spectrometer. Part D: hadron calorimeters, 7:32395 (IFVE-OEIPK—80-143)
SILANES
Electron Mobility
Dependence of conduction band energy and electron mobility on fluid density, 7:32226
SILICON
Crystal Growth
Improved amorphous Si solar cells. Quarterly progress report No. 5, February 1-April 30, 1981, 7:31852 (SERI/PR—9195-1-T3)
Electrical Properties
Improved amorphous Si solar cells. Quarterly progress report No. 5, February 1-April 30, 1981, 7:31852 (SERI/PR—9195-1-T3)
Production
Sensitivity analysis of the add-on price estimate for the silicon web growth process, 7:31838 (DOE/JPL—1012-61)
Sputtering
Characterization of ion beam processed Si surface layer, 7:32718
Technology Assessment
Silicon semiconductors, 7:32454 (SAND—82-0425)
SILICON ALLOYS
Corrosion Resistance
Composition for use in high-temperature hydrogen-fluorine environments and method for making the composition (Patent), 7:32175
SILICON HYDRIDES
See SILANES
SILICON NITRIDES
Mechanical Properties
Influence of processing conditions on the microstructure and the mechanical properties of reaction sintered silicon nitride, 7:32169 (DFVLR-FB—79-32)
Microstructure
Influence of processing conditions on the microstructure and the mechanical properties of reaction sintered silicon nitride, 7:32169 (DFVLR-FB—79-32)
SILICON OXIDES
Gas Production Rates
Preliminary evaluation of beta-spodumene as a fusion reactor structural material, 7:32880 (CONF-810831—80)
Mechanical Properties
Preliminary evaluation of beta-spodumene as a fusion reactor structural material, 7:32880 (CONF-810831—80)
Physical Radiation Effects
Preliminary evaluation of beta-spodumene as a fusion reactor structural material, 7:32880 (CONF-810831—80)
Thermodynamic Properties
Preliminary evaluation of beta-spodumene as a fusion reactor structural material, 7:32880 (CONF-810831—80)
SILICON SOLAR CELLS
Charge Carriers
Improved amorphous Si solar cells. Quarterly progress report No. 5, February 1-April 30, 1981, 7:31852 (SERI/PR—9195-1-T3)
Electrical Properties
Improved amorphous Si solar cells. Quarterly progress report No. 5, February 1-April 30, 1981, 7:31852 (SERI/PR—9195-1-T3)
SILVER
Charged-Particle Transport
Stopping power measurements with the modified UNILAC TOF-system, 7:32808 (GSI—81-2)
Hadron Reactions
Hadron-nucleus collisions. Pt. 1. Picture, description procedure, cross-sections, 7:32778 (JINR—E-1-81-154)
Leaching
Trace element characterization of coal wastes. Fifth annual progress report, October 1, 1979-September 30, 1980, 7:31728 (LA—8826-PR)
SILVER 108 TARGET
Hadron Reactions
Hadron-nucleon inelastic collision mean free path in nuclear matter, 7:32777 (JINR—E-1-80-799)
SILVER 109
Energy Levels
Nuclear chemistry research and spectroscopy with radioactive sources. Seventeenth annual progress report, 7:32787 (DOE/ER/03346—T1)
SINGLE CRYSTALS
See MONOCRYSTALS
SINTERING
Reaction Kinetics
Uranium dioxide sintering kinetics and mechanisms under controlled oxygen potentials, 7:32235 (IEA-DT—141)
SKELETON
Radionuclide Kinetics
Plutonium microdistribution in human bone, 7:32581
Scintiscanning
'Sickle-sign' in bone scintigraphy, 7:32554
Critical assessment of bone scan quantitation (bone to soft tissue ratios) in the diagnosis of metabolic bone disease, 7:32553
Development of more efficacious Tc-99m organ imaging agents for use in nuclear medicine by analytical characterization of radiopharmaceutical mixtures. Progress report, May 1, 1981-April 30, 1982, 7:32231 (DOE/EV/10380—2)
Distribution in rats after intravenous injection of ^{88}Y compounds, 7:32564
SKY
Simulation
Development and use of a hemispherical sky simulator, 7:32112 (LBL—13400)
SLABS
Radiation Transport
Transport processes in slabs bounded by reflectors, 7:32816 (USC—113P19-77)
SLUDGES
Waste Disposal
State-of-the-art of FGD sludge fixation. Final report, 7:31727 (EPRI-FP—671-Vol.3)
Waste Product Utilization
State-of-the-art of FGD sludge fixation. Final report, 7:31727 (EPRI-FP—671-Vol.3)
SLUGS (FUEL)
See FUEL RODS
SLURRIES (FUEL)
See FUEL SLURRIES

SMP DEVICES
See SCANNING MEASURING PROJECTORS
SNOW
Measuring Methods
Applied aspects of cosmic ray investigation, 7:32440
SODIUM
Leaching
Trace element characterization of coal wastes. Fifth annual progress report, October 1, 1979-September 30, 1980, 7:31728 (LA—8826-PR)
Turbulent Flow
Steady-state, local temperature fields with turbulent sodium flow in nominal and disturbed bundle geometries with spacer grids, 7:31947 (KFK—2856)
SODIUM 22
Adsorption
Research and development related to the Nevada Nuclear Waste Storage Investigations. Progress report, April 1-June 30, 1981, 7:31795 (LA—8959-PR)
SODIUM CHLORIDES
Solvent Properties
Adsorption of technetium on selected inorganic ion-exchange materials and on a range of naturally occurring minerals under oxic conditions, 7:32244
SODIUM IODIDE DETECTORS
See NAI DETECTORS
SODIUM NITRATES
Solvent Properties
Adsorption of technetium on selected inorganic ion-exchange materials and on a range of naturally occurring minerals under oxic conditions, 7:32244
SODIUM SULFATES
Solvent Properties
Adsorption of technetium on selected inorganic ion-exchange materials and on a range of naturally occurring minerals under oxic conditions, 7:32244
SODIUM-SULFUR BATTERIES
Design
Advanced-battery electrochemical-process development. Final report, 7:32071 (NYSERDA—80-36)
Performance
Advanced-battery electrochemical-process development. Final report, 7:32071 (NYSERDA—80-36)
Solid Electrolytes
Ceramics in high-performance batteries, 7:32068 (CONF-790526—3)
Fabrication and characterization of NASICON electrolytes, 7:32069 (CONF-8009134—2)
SOILS
Chemical Analysis
Determination of the uranium concentration in soil solutions by the fission track registration technique, 7:31780 (INIS-mf—6777)
Decontamination
Administrative practices to limit dose in environmental cleanup operations involving plutonium, 7:32505 (CONF-8110125—1)
Environmental Transport
Management of soil systems for the disposal of industrial wastes, 7:32497 (DP-MS—81-72)
Moisture
Applied aspects of cosmic ray investigation, 7:32440
Neutron probe and the detection of soil moisture, 7:32425
Radiation Monitoring
Environmental surveillance plan for the Department of Energy's Niagara Falls Storage Site (NFSS), Lewiston, New York, 7:31797 (NLCO—008EV)
Sorptive Properties
Effect of organic complexants on the mobility of low level waste radionuclides in soils, 7:31805 (PNL-SA—10019)
SOLAR AIR CONDITIONING
Demonstration Programs
Report on assessment of the national program for solar heating and cooling of commercial buildings, 7:31868 (IG—114)
SOLAR COLLECTORS
See also EVACUATED TUBE COLLECTORS
Technology Utilization
Solar energy-utilization from the consumers' point of view. Report on a project to determine innovation trends and barriers, 7:31870 (NP—2900958)
SOLAR CONCENTRATORS
See also LUMINESCENT CONCENTRATORS
Solar concentrators, 7:31880 (PB—82-157553)
Design
Fundamentals and techniques of nonimaging optics for solar-energy concentration. Annual progress and status summary, 7:31878 (DOE/ER/10575—2)
Optics
Fundamentals and techniques of nonimaging optics for solar-energy concentration. Annual progress and status summary, 7:31878 (DOE/ER/10575—2)
SOLAR COOLING SYSTEMS
Site Selection
Methodology for ranking cities for a solar buildings program, 7:31875 (SSEC/SP—41227)
SOLAR ENERGY
Life-Cycle Cost
Analysis of life cycle costs of solar facilities, 7:32105 (LBL—13324)
SOLAR ENERGY RESEARCH INSTITUTE
Research Programs
Alcohol fuels program technical review, 7:31840 (DOE/TIC—2006904)
SOLAR EQUIPMENT
See also PHOTOVOLTAIC POWER SUPPLIES
SOLAR COLLECTORS
SOLAR COOLING SYSTEMS
SOLAR HEATING SYSTEMS
SOLAR SIMULATORS
SOLAR WATER HEATERS
SPECTRALLY SELECTIVE SURFACES
Mechanical Vibrations
Long-life fatigue of type 316 stainless steel of temperatures up to 593 C, 7:31986
SOLAR HEATING SYSTEMS
See also PASSIVE SOLAR HEATING SYSTEMS
Buildings
Methodology for ranking cities for a solar buildings program, 7:31875 (SSEC/SP—41227)
Computer-Aided Design
FEDSOL: economic optimization guide for solar federal buildings projects. Model-simulation, 7:31833 (PB—82-135260)
Computerized Simulation
FEDSOL: economic optimization guide for solar federal buildings projects. Model-simulation, 7:31833 (PB—82-135260)
Control Systems
Multiplexed logic controls solar-heating system: inexpensive sensors and logic circuits select from four operating modes. NTIS Tech Note, 7:31871 (PB—81-971025)
Corrosion
Corrosion and scaling in solar heating systems, 7:31874 (SOLAR/0909—81/70)
Scaling
Corrosion and scaling in solar heating systems, 7:31874 (SOLAR/0909—81/70)
Site Selection
Methodology for ranking cities for a solar buildings program, 7:31875 (SSEC/SP—41227)
SOLAR PROCESS HEAT
Decision Making
Decision criteria of potential solar IPH adopters, 7:31873 (SERI/TR—663-1032)
Meetings
Proceedings of solar high-temperature industrial processes workshop, 7:31872 (SERI—0637-4)
SOLAR SIMULATORS
Construction
Development and use of a hemispherical sky simulator, 7:32112 (LBL—13400)

Design
Development and use of a hemispherical sky simulator, 7:32112 (LBL—13400)

SOLAR SPACE HEATING
Demonstration Programs
Report on assessment of the national program for solar heating and cooling of commercial buildings, 7:31868 (IG—114)

SOLAR WATER HEATERS
Life-Cycle Cost
Comparison of heat pump water heaters and solar domestic water heaters, 7:32116 (SERI/TP—254-1482)
Solar Simulators
Incident solar radiation and solar heating systems -measured and calculated, 7:31867 (DTH-LV-MEDD—106)

SOLAR WATER HEATING
Demonstration Programs
Report on assessment of the national program for solar heating and cooling of commercial buildings, 7:31868 (IG—114)

SOLDERED JOINTS
Ultrasonic Testing
Nondestructive tests on soldered joints, 7:32285

SOLID ELECTROLYTES
Fabrication
Ceramics in high-performance batteries, 7:32068 (CONF-790526—3)
Fabrication and characterization of NASICON electrolytes, 7:32069 (CONF-8009134—2)
Performance
Ceramics in high-performance batteries, 7:32068 (CONF-790526—3)
Fabrication and characterization of NASICON electrolytes, 7:32069 (CONF-8009134—2)
Reviews
Ceramics in high-performance batteries, 7:32068 (CONF-790526—3)

SOLID SCINTILLATION DETECTORS
See also NAI DETECTORS
Efficiency
Possibility of application of crystals scintillators on the basis of ammonium iodides and other analogous compounds as fast neutron detectors, 7:32389 (IAE—3281/2)
Performance Testing
Possibility of application of crystals scintillators on the basis of ammonium iodides and other analogous compounds as fast neutron detectors, 7:32389 (IAE—3281/2)

SOLID STATE PHYSICS
Lattice Field Theory
Phase transitions and elementary-particle physics, 7:32752 (BNL—30432)

SOLID WASTES
See also MINERAL WASTES
SCRAP METALS
Environmental Issues Briefing Book sections concerning water quality and solid waste regulatory issues impacting DOE plans and programs, 7:32080 (DOE/EV/10025—T1)
Chemical Composition
Identification of solid wastes in geothermal operations. Acurex draft final report 80-70/EE, 7:31895 (DOE/SF/10838—T1)

SOLIDS
Radiolysis
Rates, distances, and energy control of electron tunneling reactions in rigid media, 7:32227

SOLID-STATE PLASMA
Neutron Diffraction
Problem of neutron spectroscopy of parametrically nonequilibrium quasiparticles in solids. Pt. 1. Neutron inelastic scattering on polaritons in the parametric resonance conditions, 7:32812 (JINR—E-17-81-60)

SOLITONS
Excitation
Soliton excitation in a nonisothermal electron-ion plasma by electron bunch with given parameters, 7:32849 (EFI—442(49)-80)
Two-Dimensional Calculations
Two dimensional behavior of solitons in a low-β plasma with convective motion, 7:32863 (IPPJ—480)
Wave Propagation
Oblique collision of plane ion-acoustic solitons, 7:32859 (IPPJ—475)

SOLVENT-REFINED COAL
Chemical Analysis
Chemical/biological characterization of SRC-II product and by-products, 7:31747 (PNL-SA—8813)
Combustion
Final test report on the combustion of solvent-refined coal in a 100 hp firetube boiler, 7:31742 (DOE/PETC/TR—82/5)
Combustion Products
Final test report on the combustion of solvent-refined coal in a 100 hp firetube boiler, 7:31742 (DOE/PETC/TR—82/5)
Mutagen Screening
Chemical/biological characterization of SRC-II product and by-products, 7:31747 (PNL-SA—8813)
Testing
Final test report on the combustion of solvent-refined coal in a 100 hp firetube boiler, 7:31742 (DOE/PETC/TR—82/5)

SOLVENT-REFINING COAL PLANTS
See COAL PREPARATION PLANTS
SRC PROCESS

SOUND
See SOUND WAVES

SOUND WAVES
See also ULTRASONIC WAVES
Uses
Combustion enhancement and pollutant control research with acoustically induced mixing. Technical progress report, September 1981-December 1981, 7:31741 (DOE/PC/40270—3)

SOUTH AFRICA
Uranium Reserves
Computerised information system for the processing of borehole data with regard to uranium sources in the Republic of South Africa, 7:31785 (PER—61)

SOUTH CAROLINA
Severance Tax
Severance taxes on coal and uranium in the sunbelt, 7:31745

SOUTH DAKOTA
Natural Gas Deposits
Shallow unconventional gas applications study. Final report, 7:31768 (DOE/BC/10003—19)

SOUTHWEST REGION
See also ARKANSAS
LOUISIANA
NEW MEXICO
OKLAHOMA
TEXAS
Thermal Power Plants
Environmental, legal and political constraints on power plant siting in the southwestern United States. Special Series 16, 7:31911 (NP—2902471)

SPACE FLIGHT
Electronic Equipment
High temperature electronics in space applications, 7:32455 (SAND—82-0425)
Measuring Instruments
High temperature electronics in space applications, 7:32455 (SAND—82-0425)

SPACE LATTICES
See CRYSTAL LATTICES

SPACE VEHICLES
See also SALYUT ORBITAL STATIONS
Trajectories
User's manual for the AMEER flight path-trajectory simulation code, 7:32922 (SAND—80-2056)

SPACECRAFT POWER SUPPLIES
Nickel-Cadmium Batteries
Development of a modularized battery, 7:32070 (NP—2901049)

SPARK IGNITION ENGINES
Computerized Simulation
Simulation of a two-cycle engine and optimization of its gas-dynamic parameters of influence by means of a direct research method, 7:32126 (NP—2901109)

SPECTRA UNFOLDING
Data Processing
Directives of the SPS spectrum processing system, 7:31973 (JINR-R—10-80-861)
SPECTRALLY SELECTIVE SURFACES
Absorptivity
Solar-absorber-selective paint research, 7:31879 (LA-UR—81-3610)
Emissivity
Solar-absorber-selective paint research, 7:31879 (LA-UR—81-3610)
SPECTROMETERS
See also ALPHA SPECTROMETERS
ELECTRON SPECTROMETERS
GAMMA SPECTROMETERS
MOESSBAUER SPECTROMETERS
NEUTRON SPECTROMETERS
TIME-OF-FLIGHT SPECTROMETERS
X-RAY SPECTROMETERS
Data Processing
Organization of number sets input/output in the spectrum processing system, 7:32408 (JINR-R—10-81-56)
Multiwire Proportional Chambers
Algorithm for electron fast track recognition in C-detector of the ARES spectrometer, 7:32404 (JINR—11-81-300)
Shower Counters
European hybrid spectrometer. Part D: hadron calorimeters, 7:32395 (IFVE-OEIPK—80-143)
Spectra Unfolding
Organization of number sets input/output in the spectrum processing system, 7:32408 (JINR-R—10-81-56)
SPECTROPHOTOMETRY
Comparative Evaluations
Comparative study of some methods for the determination of uranium used at the Instituto de Pesquisas Energeticas e Nucleares, 7:32193 (IPEN-Pub—17)
SPECTROSCOPY
See also GAMMA SPECTROSCOPY
LASER SPECTROSCOPY
MESON SPECTROSCOPY
Sample Preparation
Vaporization of sediments with a pulsed transverse excitation at atmospheric pressure (TEA) CO_2 laser system, 7:32204 (Y/DK—285)
SPENT FUEL ELEMENTS
Inspection
Analysis for post irradiation examination: pt. 1, 7:31995 (KAERI/RR—247/80)
Nondestructive Analysis
Neutron measurement techniques for the nondestructive analysis of irradiated fuel assemblies, 7:31820 (LA—9002-MS)
Nondestructive Testing
Analysis for post irradiation examination: pt. 1, 7:31995 (KAERI/RR—247/80)
Test Facilities
Analysis for post irradiation examination: pt. 1, 7:31995 (KAERI/RR—247/80)
SPENT FUEL STORAGE
See also AWAY-FROM-REACTOR STORAGE
Availability
Methods of availability planning for process structures with interim storage, 7:31790
SPENT FUELS
Radioactivity
Graphical and tabular summaries of decay characteristics for once-through PWR, LMFBR, and FFTF fuel cycle materials (Spent fuel, high-level waste fuel can scrap), 7:31956 (ORNL/TM—8061)
Reprocessing
Consolidated fuel reprocessing program. Progress report, July 1-September 30, 1981, 7:31789 (ORNL/TM—8030)
Residual Power
Graphical and tabular summaries of decay characteristics for once-through PWR, LMFBR, and FFTF fuel cycle materials (Spent fuel, high-level waste fuel can scrap), 7:31956 (ORNL/TM—8061)
Toxicity
Graphical and tabular summaries of decay characteristics for once-through PWR, LMFBR, and FFTF fuel cycle materials (Spent fuel, high-level waste fuel can scrap), 7:31956 (ORNL/TM—8061)
SPERMATOZOA
Bioassay
Sperm assays in man and other mammals as indicators of chemically induced testicular dysfunction, 7:32588
Morphological Changes
Sperm assays in man and other mammals as indicators of chemically induced testicular dysfunction, 7:32588
SPIRAL READER DIGITIZERS
Calibration
Compensation of nonlinear distortions in spiral reader, 7:32402 (JINR—10-80-831)
Image Processing
Compensation of nonlinear distortions in spiral reader, 7:32402 (JINR—10-80-831)
SPUTTERING
See also CATHODE SPUTTERING
Physical Radiation Effects
Physical experiment technique, 7:32708 (KFTI—80-46)
SRC PROCESS
Process Solutions
Chemical/biological characterization of SRC-II product and by-products, 7:31747 (PNL-SA—8813)
Waste Water
Chemical/biological characterization of SRC-II product and by-products, 7:31747 (PNL-SA—8813)
SR-OB REACTOR
See SUBCRITICAL ASSEMBLIES
STACKS
Dynamic Loads
Contribution to the investigation of the STROUHAL number of high structures in natural wind for very high Reynolds numbers, 7:31901 (NP—2901105)
STAINLESS STEEL-304
Chemical Radiation Effects
Release of H and He from TiC, stainless steel, and graphite by pulsed electron and furnace heating, 7:32906
Corrosion
Ferrous alloy metallurgy - liquid-lithium corrosion and welding. Progress report, January 1, 1981-December 31, 1981, 7:32135 (DOE/ER/02313—11)
Fatigue
Ferrous alloy metallurgy - liquid-lithium corrosion and welding. Progress report, January 1, 1981-December 31, 1981, 7:32135 (DOE/ER/02313—11)
Ion Implantation
Combined depth profiling and thermal desorption of implanted deuterium in 304LN stainless steel (Diffuse Code), 7:32167
Weldability
Ferrous alloy metallurgy - liquid-lithium corrosion and welding. Progress report, January 1, 1981-December 31, 1981, 7:32135 (DOE/ER/02313—11)
STAINLESS STEEL-304L
Corrosion
Ferrous alloy metallurgy - liquid-lithium corrosion and welding. Progress report, January 1, 1981-December 31, 1981, 7:32135 (DOE/ER/02313—11)
Fatigue
Ferrous alloy metallurgy - liquid-lithium corrosion and welding. Progress report, January 1, 1981-December 31, 1981, 7:32135 (DOE/ER/02313—11)
Weldability
Ferrous alloy metallurgy - liquid-lithium corrosion and welding. Progress report, January 1, 1981-December 31, 1981, 7:32135 (DOE/ER/02313—11)
STAINLESS STEEL-316
Corrosion
Flow and fracture in the fusion environment, 7:32158 (PNL-SA—9759)
Fatigue
Long-life fatigue of type 316 stainless steel of temperatures up to 593 C, 7:31986

Fractures
Flow and fracture in the fusion environment, 7:32158 (PNL-SA—9759)
Materials Testing
Flow and fracture in the fusion environment, 7:32158 (PNL-SA—9759)
Mechanical Properties
Mechanical properties and structure of rapidly solidified high-titanium-stabilized 316 stainless steel, 7:32139 (DOE/ER/10107—5)
Microstructure
Mechanical properties and structure of rapidly solidified high-titanium-stabilized 316 stainless steel, 7:32139 (DOE/ER/10107—5)
Microstructure of rapidly solidified Al_2O_3-dispersion-strengthened Type 316 stainless steel, 7:32137 (DOE/ER/10107—3)
Microstructure of rapidly solidified Path A prime-candidate alloys following irradiation with Fe and He ions, 7:32140 (DOE/ER/10107—7)
Pre-irradiation spatial distribution and stability of boride particles in rapidly solidified boron-doped stainless steels, 7:32138 (DOE/ER/10107—4)
Physical Radiation Effects
Microstructure of rapidly solidified Path A prime-candidate alloys following irradiation with Fe and He ions, 7:32140 (DOE/ER/10107—7)

STAINLESS STEELS
STAINLESS STEEL-304
See also STAINLESS STEEL-304L
STAINLESS STEEL-316
Corrosion
Flow and fracture in the fusion environment, 7:32158 (PNL-SA—9759)
Fractures
Flow and fracture in the fusion environment, 7:32158 (PNL-SA—9759)
Materials Testing
Flow and fracture in the fusion environment, 7:32158 (PNL-SA—9759)

STANDARDS (SAFETY)
See SAFETY STANDARDS

STANDING CROP
See BIOMASS

STARS
See also SUPERNOVAE
WOLF-RAYET STARS
Gravitational Collapse
Studies of the nuclear equation of state using numerical calculations of nuclear drops collisions, 7:32606 (UCRL—86964)

STATISTICS
See also GAME THEORY
Polynomials
Tests of a simple multinomial hypothesis when the sample is not large, 7:32845 (CONF-810842—3)

STEADY FLOW
Mathematical Models
VNAP2: a computer program for computation of two-dimensional, time-dependent, compressible, turbulent flow, 7:32276 (LA—8872)

STEAM CONDENSERS
Surface Coating
Steam condensation on various gold surfaces, 7:32260

STEAM GENERATORS
Fuel Substitution
Final test report on the combustion of solvent-refined coal in a 100 hp firetube boiler, 7:31742 (DOE/PETC/TR—82/5)
Heat Transfer
Data analysis and analytical predictions of a steam generator tube bundle flow field for verification of 2-D T/H computer code (LMFBR), 7:31949
Droplet size effect on heat and mass transfer characteristics of two-phase flow in a post-CHF boiling regime. Results of a numerical experiment, 7:31982 (FEI—1128)
Hydraulics
Data analysis and analytical predictions of a steam generator tube bundle flow field for verification of 2-D T/H computer code (LMFBR), 7:31949
Double-wall tube steam generator for breeder nuclear plants, 7:31950
Mass Transfer
Droplet size effect on heat and mass transfer characteristics of two-phase flow in a post-CHF boiling regime. Results of a numerical experiment, 7:31982 (FEI—1128)
Pipes
3-D finite element analysis for the investigation of feedwater line cracking in PWR steam generators, 7:32050
Specifications
Double-wall tube steam generator for breeder nuclear plants, 7:31950
Testing
Final test report on the combustion of solvent-refined coal in a 100 hp firetube boiler, 7:31742 (DOE/PETC/TR—82/5)
Tubes
Computer intelligence design for automatic inspection of steam generator tubes (PWR type reactor.), 7:31931
Two-Phase Flow
Droplet size effect on heat and mass transfer characteristics of two-phase flow in a post-CHF boiling regime. Results of a numerical experiment, 7:31982 (FEI—1128)

STEAM LINES
Acoustic Testing
Sound monitoring for detection of pipe ruptures, 7:32283 (Juel-Spez—88)
Ruptures
Sound monitoring for detection of pipe ruptures, 7:32283 (Juel-Spez—88)

STEELS
See also AUSTENITIC STEELS
CHROMIUM STEELS
FERRITIC STEELS
STAINLESS STEELS
Embrittlement
Curve fitting and uncertainty analysis of Charpy impact data, 7:31916 (NUREG/CR—2408)
Influences of gaseous environment on low-growth-rate fatigue-crack propagation in steels. Final report, 7:32142 (DOE/ER/10389—2)
Fabrication
Manufacture of high purity steel. 2. National conference, 7:32150 (INIS-mf—6793)
Fatigue
Influences of gaseous environment on low-growth-rate fatigue-crack propagation in steels. Final report, 7:32142 (DOE/ER/10389—2)
Meetings
Manufacture of high purity steel. 2. National conference, 7:32150 (INIS-mf—6793)
Neutron Diffraction
Study of material science by neutron scattering, 7:32814 (KAERI/RR—267/80)
Physical Radiation Effects
Analysis of the behavior of advanced reactor pressure vessel steels under neutron irradiation. IAEA co-ordinated research programme, 7:32153 (IWGRRPC—79/4)
Curve fitting and uncertainty analysis of Charpy impact data, 7:31916 (NUREG/CR—2408)
Recycling
Reducing energy cost in the Scrap Iron and Steel Industry, 7:32121 (DOE/CS/20295—1)

STORAGE FACILITIES
See also NATURAL GAS
Seals
Wet powder seal for gas containment (Patent), 7:31811

STORAGE RINGS
See also CESR STORAGE RING
PEP STORAGE RINGS
PETRA STORAGE RING
Charge Exchange
Charge-exchange method of heavy ion storage for inertial thermonuclear synthesis, 7:32893 (ITEF—12(1981))

Electron Beams
Design constraints and limitations in e^+e^- storage rings, 7:32363 (SLAC—245)
Heavy Ions
Accelerator studies for heavy-ion fusion, 7:32359 (GSI—81-2)
Ion Beams
Beam losses in the storage ring due to charge changing collisions within a beam of Cs^+-ions, 7:32360 (GSI—81-2)
Efficiency of a heavy-ion fusion accelerator facility, 7:32362 (GSI—81-2)
Storage ring problems in the HIBALL-scenario, 7:32361 (GSI—81-2)
Positron Beams
Design constraints and limitations in e^+e^- storage rings, 7:32363 (SLAC—245)

STORAGE (SPENT FUEL)
See SPENT FUEL STORAGE

STRAIN GAGES
Calibration
Calibration characteristics of IRAD GAGE vibrating wire stressmeter at normal and high temperature. Volume 1, 7:32458 (UCRL—15426-Vol.1)
Calibration characteristics of IRAD GAGE vibrating wire stressmeter at normal and high temperature. Volume 2, 7:32459 (UCRL—15426-Vol.2)
Performance
Experimental analysis of a nuclear reactor prestressed concrete pressure vessels model, 7:31983 (INIS-mf—6770)
Specifications
Calibration characteristics of IRAD GAGE vibrating wire stressmeter at normal and high temperature. Volume 1, 7:32458 (UCRL—15426-Vol.1)

STRATOSPHERE
Aerosols
Nucleation and growth of stratospheric aerosols, 7:32489
Reduction of photosynthetically active radiation under extreme stratospheric-aerosol loads, 7:32474 (LA-UR—81-3573)

STRAW
Combustion Heat
Straw as energy source, 7:32307 (NP—2900612)

STREAMER SPARK CHAMBERS
Digitizers
Program package for data preparation of RISK events. Pt. 1. The description of program SMHV, 7:32406 (JINR—E-10-80-787)
Image Processing
Program package for data preparation of RISK events. Pt. 1. The description of program SMHV, 7:32406 (JINR—E-10-80-787)

STREPTOMYCES
Cellulolytic Activity
Enzymatic hydrolysis of cellulose: theory and applications, 7:31829 (LBL—13669)

STRESS (BIOLOGICAL)
See BIOLOGICAL STRESS

STRONTIUM
Complexometry
Effect of organic complexants on the mobility of low level waste radionuclides in soils, 7:31805 (PNL-SA—10019)
Solvent Extraction
Crown ethers as size-selective synergists in solvent extraction systems: a new selectivity parameter, 7:32218
Sorption
Effect of organic complexants on the mobility of low level waste radionuclides in soils, 7:31805 (PNL-SA—10019)

STRONTIUM 85
Adsorption
Radionuclide transport and retardation in tuff, 7:32523
Research and development related to the Nevada Nuclear Waste Storage Investigations. Progress report, April 1-June 30, 1981, 7:31795 (LA—8959-PR)
Environmental Transport
Radionuclide transport and retardation in tuff, 7:32523

STRONTIUM 90
Radionuclide Migration
Transfer from vegetation to meat, 7:32519 (INIS-mf—6902)

STRONTIUM HYDRIDES
Structural Chemical Analysis
Order-disorder transition in Sr_3IrD_5: evidence for square pyramidal IrD_5 units from powder neutron diffraction data, 7:32176

STRONTIUM ISOTOPES
Radionuclide Migration
Transfer from vegetation to milk, 7:32518 (INIS-mf—6902)

STRONTIUM PHOSPHATES
Optical Properties
Optical properties of Nd^{3+} in metaphosphate glasses, 7:32187

STRUCTURAL BEAMS
Stress Analysis
Development of a curved beam element model applied to finite elements method, 7:32251 (INIS-mf—6765)

STRUCTURAL MODELS
Transfer Functions
TRANSF code user manual, 7:32927 (UCID—19268)

STRUCTURES (MECHANICS)
See MECHANICAL STRUCTURES

STTFUA
Meetings
Proceedings of solar high-temperature industrial processes workshop, 7:31872 (SERI—0637-4)

STYRENE
Chemical Radiation Effects
Primary processes of the radiation-induced cationic polymerization of aromatic olefins studied by pulse radiolysis (Electron beams), 7:32224 (ZfI-Mitt—35)

STYRENE POLYMERS
See POLYSTYRENE

SUBBITUMINOUS COAL
Dissolution
Radical pathways of coal dissolution in donor media during reactions of coals and specifically deuterated tetralin, 7:31719 (PNL-SA—9020)

SUBCRITICAL ASSEMBLIES
Breeding Blankets
Fission rates and ^{238}U capture rates for loading 1 of the Fast Breeder Blanket Facility, 7:32008 (PNE—81-150)
Reaction Kinetics
Decay constants of a subcritical system by two-group diffusion theory, 7:31960 (CTA-EAV—007/79)
Fission rates and ^{238}U capture rates for loading 1 of the Fast Breeder Blanket Facility, 7:32008 (PNE—81-150)

SUBCRITICAL FLOW
See LAMINAR FLOW

SUBSONIC FLOW
Two-Dimensional Calculations
Calculation of the flow in axial-flow compressors by means of a 2-dimensional method, considering the flow in the side-wall boundary layer and the secondary flow, 7:32277 (NP—2901095)

SUGARS
See SACCHARIDES

SULFATES
Atmospheric Chemistry
Nucleation and growth of stratospheric aerosols, 7:32489
Solvent Properties
Crown ethers as size-selective synergists in solvent extraction systems: a new selectivity parameter, 7:32218

SULFUR
Desorption
Hydrogen ion impact desorption of sulfur from stainless steel, 7:32166
Ion Implantation
Hydrogen ion impact desorption of sulfur from stainless steel, 7:32166

SULFUR CARBIDES
See CARBON SULFIDES

SULFUR HYDRIDES
See HYDROGEN SULFIDES

SULFUR TRIOXIDE
Chemical Reaction Kinetics
Experimental investigation about the kinetics of sulfur trioxide-splitting, 7:32212 (Juel—1669)

Decomposition
Experimental investigation about the kinetics of sulfur trioxide-splitting, 7:32212 (Juel—1669)
SUPER HIGH FREQUENCY RADIATION
See RADIOWAVE RADIATION
SUPERCONDUCTING MAGNETS
Cryogenics
Cooling of superconducting magnet with superfluid He, 7:32263
Stability and fast heat removal with He-II cooling for pulsed superconductive magnets, 7:32262
Stabilization of large superconducting magnets in superfluid helium. Heat transfer aspects, 7:32264
SUPERCRITICAL FLOW
See TURBULENT FLOW
SUPERGIANT STARS
Neutrinos
Binary system as a hidden source of high energy neutrinos, 7:32683
SUPERHEAVY ELEMENTS
See TRANS 104 ELEMENTS
SUPERNOVAE
Gravitational Collapse
Monte Carlo study of neutrino acceleration in supernova shocks, 7:32684
SUPERSONIC TRANSPORT
Mathematical Models
Should we trust models or observations (Effects of supersonic transport and atmospheric nuclear tests on the ozone layer), 7:32483
SUPPORTS
Seismic Effects
Dynamic analysis techniques--a sensitivity study for piping systems at a nuclear power plant, 7:32065
Generic methods for design of small-bore pipe supports, 7:32063
Stress Analysis
Dynamic analysis techniques--a sensitivity study for piping systems at a nuclear power plant, 7:32065
Evaluation of pipe support stiffness and its effect on piping response, 7:32064
SURFACE AIR
See also AIR
EARTH ATMOSPHERE
Radiation Monitoring
Environmental surveillance plan for the Department of Energy's Niagara Falls Storage Site (NFSS), Lewiston, New York, 7:31797 (NLCO—008EV)
SURFACE BARRIER DETECTORS
Programmable α-spectrometer for radiochemical studies, 7:32417 (NIIAR—41(449))
SURFACE MINING
See also COAL MINING
Coal Preparation
Trends of development in opencast mining at increased diesel prices, 7:32308
Land Reclamation
Guide for revegetating coal minesoils in the Eastern United States, 7:31729 (PB—81-245011)
Mine Haulage
Trends of development in opencast mining at increased diesel prices, 7:32308
SURFACE WATERS
See also COASTAL WATERS
RIVERS
Contamination
Problem of the validity of a specific activity model for tritium, 7:32533 (INIS-mf—6902)
Radiation Monitoring
Environmental surveillance plan for the Department of Energy's Niagara Falls Storage Site (NFSS), Lewiston, New York, 7:31797 (NLCO—008EV)
SURFACES
See also SPECTRALLY SELECTIVE SURFACES
Deformation
X-ray-measurable deformations in superficial layers and their representations, 7:32293
SUSPENSIONS (FUEL)
See FUEL SLURRIES
SUSQUEHANNA RIVER
Radionuclide Migration
Reactor-released radionuclides in Susquehanna River sediments, 7:32522
Sediments
Reactor-released radionuclides in Susquehanna River sediments, 7:32522
SYNCHROTRON RADIATION
Biophysics
Synchrotron radiation sources for photobiology and ultraviolet, visible and infrared spectroscopy, 7:32424
SYNCHROTRONS
See also EREVAN SYNCHROTRON
FERMILAB ACCELERATOR
KEK SYNCHROTRON
NSLS
Lattice of the booster synchrotron SIS40, 7:32318 (GSI—81-2)
SIS - an accelerator facility for relativistic heavy ions, 7:32317 (GSI—81-2)
Control Systems
Amplitude, frequency and phase control for the SIS accelerating cavities, 7:32343 (GSI—81-2)
Preparatory work for the SIS magnet measuring equipment, 7:32341 (GSI—81-2)
On-Line Control Systems
On-line control of ferrite measurements performed by a desktop computer, 7:32342 (GSI—81-2)
Vacuum Systems
UHV-test-section for SIS, 7:32329 (GSI—81-2)
SYNROC
See SYNTHETIC ROCKS
SYNTHETIC FUELS
See also ALCOHOL FUELS
HYDROGEN FUELS
SYNTHETIC PETROLEUM
Gas Spills
Assessment of synfuel spill cleanup options, 7:31730 (PNL-SA—9806)
Oil Spills
Assessment of synfuel spill cleanup options, 7:31730 (PNL-SA—9806)
Stability
Future distillate fuels: what, when, where, and how stable, 7:31828
Stability of diesel fuels made from shale oil, 7:31775
SYNTHETIC PETROLEUM
Toxicity
Toxicity of a coal liquefaction product to aquatic organisms, 7:32593
SYNTHETIC ROCKS
Leaching
High-level waste immobilization program. Quarterly report, October-December 1979, 7:31800 (PNL-SA—8408)
SYSTEMS ANALYSIS
Data Covariances
Data inaccuracies in reliability calculations of technical systems, 7:32297

T

TANTALUM 181 TARGET
Photonuclear Reactions
Resonance scattering of 3-5 MeV γ-quanta emitted at radioactive decay, 7:32786 (JINR-R—15-81-151)
TANTALUM COMPLEXES
Chemical Preparation
Reduction of carbon monoxide. Past research summary, 7:32215 (DOE/ER/04949—1)
Chemical Reactions
Reduction of carbon monoxide. Past research summary, 7:32215 (DOE/ER/04949—1)

Research Programs
Reduction of carbon monoxide. Past research summary, 7:32215 (DOE/ER/04949—1)
Structural Chemical Analysis
Reduction of carbon monoxide. Past research summary, 7:32215 (DOE/ER/04949—1)
TARGET CHAMBERS
Design
Window- and target-system for damped heavy-ion reactions at the gasjet with intense heavy-ion beams, 7:32349 (GSI—81-2)
TARGETS
See also ALUMINIUM 27 TARGET
BERYLLIUM 9 TARGET
BISMUTH 209 TARGET
CARBON 12 TARGET
COPPER 64 TARGET
CURIUM 248 TARGET
DEUTERIUM TARGET
LASER TARGETS
LEAD 207 TARGET
LEAD 208 TARGET
MOLYBDENUM 94 TARGET
NEODYMIUM 143 TARGET
NICKEL 60 TARGET
NIOBIUM 93 TARGET
OSMIUM 187 TARGET
OSMIUM 189 TARGET
PLUTONIUM 239 TARGET
RADIUM 226 TARGET
SAMARIUM 147 TARGET
SAMARIUM 149 TARGET
SCANDIUM 45 TARGET
SILVER 108 TARGET
TANTALUM 181 TARGET
THALLIUM 203 TARGET
THALLIUM 205 TARGET
URANIUM 233 TARGET
URANIUM 235 TARGET
URANIUM 238 TARGET
XENON 131 TARGET
ZIRCONIUM 90 TARGET
ZIRCONIUM 92 TARGET
Fabrication
Production of thin targets of high isotopic enrichment with an electromagnetic separator, 7:32346 (GSI—81-2)
TAXICABS
Operation
Impact of flywheel-energy-storage technology upon taxicab fleet operation in a large metropolitan city, 7:32130 (LA-UR—81-3071)
TEARING INSTABILITY
Analytical Solution
Tearing modes in a current sheet with weak normal magnetic field, 7:32858 (IPPJ—474)
Nonlinear Problems
Finite-beta effects on the nonlinear evolution of the (m = 1;n = 1) mode in tokamaks, 7:32875 (ORNL/TM—8063)
Numerical study of explosive tearing mode instability in one-component plasmas, 7:32868 (IPPJ—486)
TECHNETIUM 95
Adsorption
Adsorption of technetium on selected inorganic ion-exchange materials and on a range of naturally occurring minerals under oxic conditions, 7:32244
Research and development related to the Nevada Nuclear Waste Storage Investigations. Progress report, April 1-June 30, 1981, 7:31795 (LA—8959-PR)
TECHNETIUM 99
Radioisotope Generators
Development of more efficacious Tc-99m organ imaging agents for use in nuclear medicine by analytical characterization of radiopharmaceutical mixtures. Progress report, May 1, 1981-April 30, 1982, 7:32231 (DOE/EV/10380—2)
Radionuclide Migration
Tc enrichment in plants through the roots, 7:32511 (INIS-mf—6902)
Transfer from vegetation to milk, 7:32518 (INIS-mf—6902)
TECHNETIUM COMPLEXES
Liquid Column Chromatography
Development of more efficacious Tc-99m organ imaging agents for use in nuclear medicine by analytical characterization of radiopharmaceutical mixtures. Progress report, May 1, 1981-April 30, 1982, 7:32231 (DOE/EV/10380—2)
Radiopharmaceuticals
Quantity control procedures for sup(99m)Ic complexes, 7:32560
TECHNETIUM COMPOUNDS
Classification
Nature of technetium compounds. Pt. 1, 7:32558
Radionuclide Kinetics
Nature of technetium compounds. Pt. 1, 7:32558
TECHNOLOGY ASSESSMENT
Socio-Economic Factors
Technology assessment. Pt. 2, 7:32538
TENNESSEE
Severance Tax
Severance taxes on coal and uranium in the sunbelt, 7:31745
TERBIUM 149
Energy Levels
^{149}Dy beta decay and ^{149}Tb excited states, 7:32780 (JINR-R—6-81-23)
TEST FACILITIES
Analysis for post irradiation examination: pt. 1, 7:31995 (KAERI/RR—247/80)
Fabrication
Combustion enhancement and pollutant control research with acoustically induced mixing. Technical progress report, September 1981-December 1981, 7:31741 (DOE/PC/40270—3)
TESTES
Physiology
Sperm assays in man and other mammals as indicators of chemically induced testicular dysfunction, 7:32588
TETRAHYDRONAPHTHALENE
See TETRALIN
TETRALIN
Chemical Reactions
Radical pathways of coal dissolution in donor media during reactions of coals and specifically deuterated tetralin, 7:31719 (PNL-SA—9020)
TEXAS
Severance Tax
Severance taxes on coal and uranium in the sunbelt, 7:31745
THALLIUM
Foam Separation
Concentration of trace elements from Cheleken peninsula thermal brines by means of foam flotation, 7:32195 (JINR—6-81-75)
THALLIUM 201
Radionuclide Kinetics
Differences between ^{201}Tl and ^{43}K tissue distribution in rested and exercised rats, 7:32575
THALLIUM 203 TARGET
Calcium 48 Reactions
Study on the ^{48}Ca ion fusion with sup(203,205)Tl, sup(208)Pb and sup(209)Bi nuclei, 7:32790 (JINR-R—7-12061)
THALLIUM 205 TARGET
Calcium 48 Reactions
Study on the ^{48}Ca ion fusion with sup(203,205)Tl, sup(208)Pb and sup(209)Bi nuclei, 7:32790 (JINR-R—7-12061)
THERMAL BATTERIES
Design
Resistance after firing protected electric match (Patent), 7:32072
Safety Engineering
Resistance after firing protected electric match (Patent), 7:32072
THERMAL NEUTRONS
Neutron Diffraction
Radiations and their scattering by matter. Chapter 4.3. Neutrons, 7:32817
THERMAL POWER PLANTS
See also COMBINED-CYCLE POWER PLANTS
FOSSIL-FUEL POWER PLANTS
GEOTHERMAL POWER PLANTS
NUCLEAR POWER PLANTS
Availability
Reliability and availability of power plant systems, 7:32296

Reliability
Reliability and availability of power plant systems, 7:32296
Reliability studies in a power plant system, 7:31910
THERMAL REACTORS
See also BSR-1 REACTOR
BSR-2 REACTOR
CANDU TYPE REACTORS
HDR REACTOR
HFIR REACTOR
MUELHEIM-KAERLICH REACTOR
THREE MILE ISLAND-2 REACTOR
VK-50 REACTOR
Multiplication Factors
Heterogeneous reactors, 7:31962 (CTA-EAV-NT—011/79)
THERMAL STORAGE
See HEAT STORAGE
THERMOLUMINESCENCE
Physical Radiation Effects
TL-studies of ion-implanted CaF_2, 7:32181 (GSI—81-2)
THERMOLUMINESCENT DOSEMETERS
Performance Testing
Dependence of LiF thermoluminescent detector response positioned behind different absorbers on energy of gamma radiation, 7:32414 (JINR-R—16-81-330)
Sensitivity
Dependence of LiF thermoluminescent detector response positioned behind different absorbers on energy of gamma radiation, 7:32414 (JINR-R—16-81-330)
THERMOMETERS
High-temperature-measuring device (Patent), 7:32463
Temperature-profile detector (Patent), 7:32461
THERMONUCLEAR DEVICES
See also TOKAMAK DEVICES
General and nuclear physics, 7:32874 (KFTI—80-37)
THERMONUCLEAR FUELS
Fabrication
Pellet production methods for fueling fusion devices, 7:31821 (IPP—4/188)
Turbulence
Anomalous viscosity due to weak turbulence in imploding target plasma, 7:32892 (IPPJ—473)
THERMONUCLEAR REACTOR MATERIALS
Electric Arcs
Deuterium plasma-material wall interactions. Final report, 1 May 1979-30 September 1981, 7:32886 (DOE/ET/52008—2)
Materials Testing
Irradiation response of materials. Final Quarterly technical progress report, 7:32887 (DOE/ET/52018—16)
Mechanical Properties
Development of a miniaturized disk-bend test for the determination of postirradiation mechanical properties, 7:32885 (DOE/ER/10107—12)
Microstructure
Irradiation response of materials. Final Quarterly technical progress report, 7:32887 (DOE/ET/52018—16)
Microstructure of neutron irradiated rapidly solidified Path A Prime-Candidate Alloys, 7:32881 (DOE/ER/10107—6)
Microstructure of rapidly solidified Path A Prime-Candidate Alloys, 7:32882 (DOE/ER/10107—8)
Physical Radiation Effects
Irradiation response of materials. Final Quarterly technical progress report, 7:32887 (DOE/ET/52018—16)
Microstructure of neutron irradiated rapidly solidified Path A Prime-Candidate Alloys, 7:32881 (DOE/ER/10107—6)
Microstructure of rapidly solidified Path A Prime-Candidate Alloys, 7:32882 (DOE/ER/10107—8)
Recoils
Recoil resolution and particle stability under irradiation, 7:32884 (DOE/ER/10107—11)
Stability
Recoil resolution and particle stability under irradiation, 7:32884 (DOE/ER/10107—11)
Test Facilities
Development of a miniaturized disk-bend test for the determination of postirradiation mechanical properties, 7:32885 (DOE/ER/10107—12)
THERMONUCLEAR REACTORS
(For use in cases where certain aspects of either hypothetical or real thermonuclear reactors are discussed.)
See also D-T REACTORS
JT-60 REACTORS
LASER FUSION REACTORS
Colliding Beams
Wrapping screw: An alternative to synchrotron type storage rings for HIF, 7:32351 (GSI—81-2)
Radiation Hazards
Overview of fusion reactor safety, 7:32879 (CONF-810801—59)
Reactor Fueling
Pellet production methods for fueling fusion devices, 7:31821 (IPP—4/188)
Safety
Overview of fusion reactor safety, 7:32879 (CONF-810801—59)
THERMONUCLEAR WEAPONS
See NUCLEAR WEAPONS
THIOBACILLUS OXIDANS
Application of bacterial leaching technology to deep solution-mining conditions for uranium extraction. Final report, September 1, 1978-September 30, 1981, 7:31784 (NP—2902698)
THIOPHENOLS
Removal
Stabilization of No. 2 fuel oils with caustic treating and additives, 7:31764
THORIUM
Self-Diffusion
Model of diffusion of metals. 2. Effect of polymorphic transformations on self-diffusion parameters, 7:32232 (FEI—1094)
THORIUM OXIDES
Spectral Reflectance
Thermal radiation properties of ThO/sub 2/ in contact with sodium and steel, 7:31996
Surface Properties
Thermal radiation properties of ThO/sub 2/ in contact with sodium and steel, 7:31996
THREE MILE ISLAND-2 REACTOR
After-Heat Removal
Heat exchanger applications during TMI-2 post accident cooldown, 7:32039
Comparative Evaluations
Lessons from major accidents, 7:32051
Radioactive Waste Disposal
Reactor-released radionuclides in Susquehanna River sediments, 7:32522
Reactor Accidents
Lessons from major accidents, 7:32051
Reactor Safety
Heat exchanger applications during TMI-2 post accident cooldown, 7:32039
THREE-BODY PROBLEM
Faddeev Equations
Scattering integral equations and four-nucleon problem. Integral equations for Weinberg quasiparticles, 7:32799 (ITEP—13(1981))
Fredholm Equation
Scattering integral equations and four-nucleon problem. Integral equations for Weinberg quasiparticles, 7:32799 (ITEP—13(1981))
THULIUM SELENIDES
Neutron Diffraction
High-pressure neutron and X-ray diffraction study of TmSe, 7:32165
Inelastic neutron scattering studies of single crystal TmSe, 7:32820
THYROID
Carcinomas
Carcinoma in hyperfunctioning thyroid nodule in recurrent hyperthyroidism, 7:32559
Scintiscanning
Carcinoma in hyperfunctioning thyroid nodule in recurrent hyperthyroidism, 7:32559

THYROID HORMONES
Radioassay
Determination of endogenous labelling of thyroid hormones during a radioiodide test in euthyroid goiter patients and hyperthyroid patients, 7:32561
THYROTOXICOSIS
See HYPERTHYROIDISM
TIME PROJECTION CHAMBERS
See PROJECTION SPARK CHAMBERS
TIME-OF-FLIGHT METHOD
Measuring Instruments
Stopping power measurements with the modified UNILAC TOF-system, 7:32808 (GSI—81-2)
TIME-OF-FLIGHT SPECTROMETERS
Coincidence Spectrometry
Neutron spectra measuring by magnetless hadron spectrometer, 7:32399 (ITEF—159(1980))
Energy Resolution
Neutron spectra measuring by magnetless hadron spectrometer, 7:32399 (ITEF—159(1980))
Ionization Chambers
Detector development for the 5 m time-of-flight spectrometer, 7:32387 (GSI—81-2)
Position Sensitive Detectors
Detector development for the 5 m time-of-flight spectrometer, 7:32387 (GSI—81-2)
TIN 113
Adsorption
Research and development related to the Nevada Nuclear Waste Storage Investigations. Progress report, April 1-June 30, 1981, 7:31795 (LA—8959-PR)
TIN ISOTOPES
Charge-Exchange Reactions
Energy splitting between the $T=T_0$ and $T=T_0$-1 components of the charge-exchange vector dipole resonance, 7:32774 (IFUSP-P—246)
TISSUES
Nuclear Reaction Analysis
Study on lethal effect on cells by determination of ^{10}B in biological tissues and (n, α) reaction. Quantitative determination of ^{10}B in biological tissues by soiled state track detection, 7:32571 (KURRI-TR—195)
TITANIUM
Charged-Particle Transport
Stopping power measurements with the modified UNILAC TOF-system, 7:32808 (GSI—81-2)
Electric Conductivity
Electric conductivity of titanium, zirconium, hafnium and its alloys. Communication 1, 7:32147 (FEI—1149)
TITANIUM ALLOYS
See also TITANIUM BASE ALLOYS
Critical Current
Nb-Ti base high-field superconductors with current capacities in excess of 3000 A for application in magnet systems with alternating field components, 7:32844 (BMFT-FB-T—81-009)
Superconductivity
Nb-Ti base high-field superconductors with current capacities in excess of 3000 A for application in magnet systems with alternating field components, 7:32844 (BMFT-FB-T—81-009)
TITANIUM BASE ALLOYS
Microstructure
Deuterium plasma-material wall interactions. Final report, 1 May 1979-30 September 1981, 7:32886 (DOE/ET/52008—2)
TITANIUM BORIDES
Erosion
Surface composition and erosion yields for CVD TiB_2 films subjected to low energy deuterium ion bombardment, 7:32715
Sputtering
Surface composition and erosion yields for CVD TiB_2 films subjected to low energy deuterium ion bombardment, 7:32715
TITANIUM CARBIDES
Chemical Radiation Effects
Release of H and He from TiC, stainless steel, and graphite by pulsed electron and furnace heating, 7:32906
TITANIUM HYDRIDES
Atom Transport
Mound Facility activities in chemical and physical research: January-June 1981, 7:31825 (MLM—2884)
TMX DEVICES
Plasma Macroinstabilities
Stability of low-frequency modes in tandem mirrors and bumpy tori, 7:32877 (SAI—254-81-387-LJ)
Reviews
State of work on the AMBAL experiment, 7:32902 (UCID—19206)
TOKAMAK DEVICES
See also ALCATOR DEVICE
Charged-Particle Transport
Transport processes in a tokamak with adiabatic compression. Mathematical model and first-stage calculating results, 7:32854 (IAE—3321/8)
Cost Benefit Analysis
Survey of nuclear fusion technology. A prospect analysis of tokamak fusion research, 7:32897 (KAERI/RR—275/80)
ECR Heating
Efficiency of plasma electron cyclotron-resonance heating in the TM-3 tokamak, 7:32855 (IAE—3324/7)
Electronic Circuits
Electronic system of TBR tokamak device, 7:32889 (INIS-mf—6769)
Feedback
Stabilization of a vertical instability by a feedback system at the T-12 installation, 7:32852 (IAE—3268/7)
High-Frequency Heating
Mechanism for ion heating by lower hybrid waves, 7:32860 (IPPJ—476)
Kink Instability
Theory of the M = 1 mode in high temperature plasmas, 7:32856 (IPP—6-201)
Plasma Density
Numerical simulation of density evolution in JIPP T-2 tokamak, 7:32865 (IPPJ—483)
Plasma Simulation
One-dimensional transport code for the simulation of D-T burning tokamak plasma. POISE 1, 7:32872 (JAERI-M—9167)
Specifications
Preliminary results of the TBR-small Tokamak, 7:32888 (IFUSP-P—270)
TOOLS (EDUCATIONAL)
See EDUCATIONAL TOOLS
TOPOGRAPHY
Mathematical Models
Nocturnal drainage flow over complex terrain using a generalized shallow fluid approximation, 7:32477
TOTAL-ABSORPTION SPECTROMETERS
See SHOWER COUNTERS
TOWER FOCUS POWER PLANTS
See also BARSTOW SOLAR PILOT PLANT
Computer Codes
Solar energy systems simulation and analysis. 2nd quarterly progress report, January 1-March 31, 1980, 7:31861 (DOE/SF/10763—T13)
Computerized Simulation
Solar energy systems simulation and analysis. 2nd quarterly progress report, January 1-March 31, 1980, 7:31861 (DOE/SF/10763—T13)
TOXIC MATERIALS
Environmental Issues Briefing Book sections concerning water quality and solid waste regulatory issues impacting DOE plans and programs, 7:32080 (DOE/EV/10025—T1)
TPC
See PROJECTION SPARK CHAMBERS
TRANS 104 ELEMENTS
See also ELEMENT 105
ELEMENT 106
ELEMENT 108
Separation Processes
Separation of volatile superheavy elements from copper catchers, 7:32189 (GSI—81-2)

TRANSFER (HEAT)
See HEAT TRANSFER
TRANSFORMERS
Metals
Amorphous metals: cutting losses in the core, 7:32086
Research Programs
Amorphous metals: cutting losses in the core, 7:32086
TRANSITIONS (ENERGY LEVEL)
See ENERGY-LEVEL TRANSITIONS
TRANSMISSION LINES
See POWER TRANSMISSION LINES
TRANSPORTATION SYSTEMS
Regional Analysis
Interplay between urban pattern, traffic, and energy consumption. Report 1. The traffic behaviour, 7:32119 (NP—2900604)
TRANSURANIUM ELEMENTS
See also PLUTONIUM
Chemical Properties
Physical-chemical studies of transuranium elements. Progress report, April 1, 1981-March 31, 1982, 7:32230 (DOE/ER/04447—137)
Physical Properties
Physical-chemical studies of transuranium elements. Progress report, April 1, 1981-March 31, 1982, 7:32230 (DOE/ER/04447—137)
Research Programs
Physical-chemical studies of transuranium elements. Progress report, April 1, 1981-March 31, 1982, 7:32230 (DOE/ER/04447—137)
TRANSURANIUM WASTES
See ALPHA-BEARING WASTES
TRAPPED ELECTRONS
Rates, distances, and energy control of electron tunneling reactions in rigid media, 7:32227
TRAPPED-PARTICLE INSTABILITY
Analytical Solution
Mixing length hypothesis in the dissipative trapped ion instability, 7:32864 (IPPJ—481)
TRICHODERMA
Cellulolytic Activity
Enzymatic hydrolysis of cellulose: theory and applications, 7:31829 (LBL—13669)
TRIPLET PARTICLES
See QUARKS
TRITIUM
Chemical Reactions
Mound Facility activities in chemical and physical research: January-June 1981, 7:31825 (MLM—2884)
Desorption
Trapping, detrapping and replacement of KeV hydrogen implanted into graphite, 7:32908
Mesic Molecules
Possible effect of strong interaction on mesic molecule systems properties, 7:32706 (JINR-R—4-81-72)
Radioecological Concentration
Problem of the validity of a specific activity model for tritium, 7:32533 (INIS-mf—6902)
Radionuclide Migration
Transfer from vegetation to milk, 7:32518 (INIS-mf—6902)
Trapping
Trapping, detrapping and replacement of KeV hydrogen implanted into graphite, 7:32908
Uptake
Tritium uptake by plants, 7:32506 (INIS-mf—6902)
TROUT
Sensitivity
Combined effects of nickel, chlorine, and temperature on the mortality of rainbow trout, Salmo gairdneri, 7:32589
TRU WASTES
See ALPHA-BEARING WASTES
TSUKUBA KEK SYNCHROTRON
See KEK SYNCHROTRON
TUBES
(For objects of tubular shape; not for DRIFT TUBES, ELECTRON TUBES or IMAGE STORAGE TUBES.)
Eddy Current Testing
Computer intelligence design for automatic inspection of steam generator tubes (PWR type reactor.), 7:31931
TUBES (CONDUITS)
See PIPES
TUFF
Fluid Mechanics
In-situ tuff water migration/heater experiment: hardware mechanical design definition, 7:31808 (SAND—81-1048)
Geochemistry
Research and development related to the Nevada Nuclear Waste Storage Investigations. Progress report, April 1-June 30, 1981, 7:31795 (LA—8959-PR)
Mineralogy
Research and development related to the Nevada Nuclear Waste Storage Investigations. Progress report, April 1-June 30, 1981, 7:31795 (LA—8959-PR)
Petrology
Research and development related to the Nevada Nuclear Waste Storage Investigations. Progress report, April 1-June 30, 1981, 7:31795 (LA—8959-PR)
Radionuclide Migration
Radionuclide transport and retardation in tuff, 7:32523
Sorptive Properties
Radionuclide transport and retardation in tuff, 7:32523
Research and development related to the Nevada Nuclear Waste Storage Investigations. Progress report, April 1-June 30, 1981, 7:31795 (LA—8959-PR)
Temperature Effects
In-situ tuff water migration/heater experiment: hardware mechanical design definition, 7:31808 (SAND—81-1048)
TUMOR CELLS
Cytological Techniques
Differentiated state of normal and malignant cells or how to define a normal cell in culture, 7:32542
TUNGSTEN COMPLEXES
Catalytic Effects
Integrated approach to the systematic synthesis, characterization, and catalytic activity of novel heterogeneous catalysts. Final progress report, 7:32206 (DOE/ER/10381—3)
TUNNELING
Meetings
Colloquium on underground working and tunnelling, 7:31731 (CONF-790273—(Vol3))
TURBOGENERATORS
Manufacturing
French electromechanical industry in the nuclear sector, 7:31915 (FRNC-CONF—206)
TURBULENT FLOW
Mathematical Models
VNAP2: a computer program for computation of two-dimensional, time-dependent, compressible, turbulent flow, 7:32276 (LA—8872)
TWO-PHASE FLOW
Inertial and damping properties of a two-phase mixture with surface-active agents, 7:31981 (FEI—1104)
Mathematical Models
Heat transfer between particles and fluid in aerated beds, 7:32282

U

UCLBL
See LAWRENCE BERKELEY LABORATORY
UCLLL
See LAWRENCE LIVERMORE LABORATORY
UHF RADIATION (01-100 GHZ)
See RADIOWAVE RADIATION
UHF RADIATION (100-1000 MHZ)
See RADIOWAVE RADIATION
UHF RADIATION (LOWER RANGE)
See RADIOWAVE RADIATION

UHF RADIATION (UPPER RANGE)
See RADIOWAVE RADIATION
ULTRASONIC TESTING
Calculations of the reflection and transmission of ultrasound by rough sodium-filled defects in steel (LMFBR), 7:31942 (AERE-R—10095)
Development of nondestructive testing technique. Ultrasonic testing and radiographic testing, 7:32453 (KAERI/RR—262/80)
Equipment
Single crystal metal wedges for surface acoustic wave propagation (Patent), 7:32284
Rayleigh Scattering
Effects at the extension of short ultrasonoic pulses in scattering materials, 7:32290
ULTRASONIC WAVES
Genetic Effects
Research in theoretical physics. Annual progress report, April 1, 1981-March 31, 1982, 7:32738 (DOE/ER/03285—41)
Scattering
Effects at the extension of short ultrasonoic pulses in scattering materials, 7:32290
ULTRASONICS
See ULTRASONIC WAVES
ULTRAVIOLET RADIATION
Radiometers
Optoelectronic display units - status and trends, 7:32460
ULYANOVSK REACTOR VK-50
See VK-50 REACTOR
UNDERGROUND MINING
See also LONGWALL MINING
Electrical Equipment
Measurements of impedances for determinating the minimum short-circuit current in main systems 500 V of underground mining establishments, 7:32309
Hoists
Recent developments in automatic hauling winches, 7:32310
Meetings
Colloquium on underground working and tunnelling, 7:31731 (CONF-790273—(Vol3))
UNIFIED GAUGE MODELS
Research in theoretical physics. Annual progress report, April 1, 1981-March 31, 1982, 7:32738 (DOE/ER/03285—41)
Lattice Field Theory
High-temperature expansion and Monte Carlo simulation of SU(5) gauge theory on a four-dimensional lattice: A comparison, 7:32760
UNILAC
Engineering and technology, 7:32335 (GSI—81-2)
Beam Bending Magnets
Prototype thyristor-controlled power supply, 7:32332 (GSI—81-2)
Beam Dynamics
Plasma oscillations induced intensity modulations of the Unilac ion beam, 7:32322 (GSI—81-2)
Beam Monitors
New emittance measuring device of the Unilac, 7:32336 (GSI—81-2)
Beam Transport
Method for computer aided alignment of the Unilac beam, 7:32339 (GSI—81-2)
On-line transverse beam matching at the Unilac, 7:32338 (GSI—81-2)
On-Line Control Systems
Process control of the UNILAC, 7:32334 (GSI—81-2)
Operation
Unilac operation, 7:32315 (GSI—81-2)
RF Systems
μP-control of rf-systems at the Unilac, 7:32340 (GSI—81-2)
UNITED KINGDOM
Energy Consumption
Growth of energy consumption and prices in the USA, FRG, France, and the UK, 1950-1979, 7:32110 (IIASA-WP—80-126)
Gross Domestic Product
Growth of energy consumption and prices in the USA, FRG, France, and the UK, 1950-1979, 7:32110 (IIASA-WP—80-126)
UNITED STATES OF AMERICA
See USA
UNSTEADY FLOW
Mathematical Models
VNAP2: a computer program for computation of two-dimensional, time-dependent, compressible, turbulent flow, 7:32276 (LA—8872)
UPSILON RESONANCES
Particle Decay
QCD and heavy quark atoms, 7:32748 (SLAC—245)
URANATES
Electron Spin Resonance
Electron paramagnetic resonance and crystal structure study of bis(triphenylphosphine)iminium hexafluorouranate(V), 7:32239
Lattice Parameters
Electron paramagnetic resonance and crystal structure study of bis(triphenylphosphine)iminium hexafluorouranate(V), 7:32239
URANIUM
Activation Analysis
Comparative study of some methods for the determination of uranium used at the Instituto de Pesquisas Energeticas e Nucleares, 7:32193 (IPEN-Pub—17)
Study on the neutron activation analysis, 7:32199 (KAERI/RR—272/80)
Delayed Neutron Analysis
Comparative study of some methods for the determination of uranium used at the Instituto de Pesquisas Energeticas e Nucleares, 7:32193 (IPEN-Pub—17)
Ion Exchange
Study on the neutron activation analysis, 7:32199 (KAERI/RR—272/80)
Leaching
Application of bacterial leaching technology to deep solution-mining conditions for uranium extraction. Final report, September 1, 1978-September 30, 1981, 7:31784 (NP—2902698)
Nuclear Reaction Analysis
Determination of the uranium concentration in soil solutions by the fission track registration technique, 7:31780 (INIS-mf—6777)
Rydberg Correction
Rydberg atoms, 7:32688 (AERE-R—9986)
Self-Diffusion
Model of diffusion of metals. 2. Effect of polymorphic transformations on self-diffusion parameters, 7:32232 (FEI—1094)
Severance Tax
Severance taxes on coal and uranium in the sunbelt, 7:31745
Solubility
Impurities diffusion in binary titanium-zirconium and titanium-aluminium alloys in a bcc solid-solution range, 7:32146 (FEI—1145)
Spectrophotometry
Comparative study of some methods for the determination of uranium used at the Instituto de Pesquisas Energeticas e Nucleares, 7:32193 (IPEN-Pub—17)
Sputtering
Target sputtering by multicharged heavy ion beams, 7:32711 (RI—120)
URANIUM 233 TARGET
Sample Preparation
Preparation of thin targets of ^{239}Pu, ^{233}U and ^{235}U by the method of electrospraying, 7:32228 (AAEC/E—512)
URANIUM 235
Gamma Spectroscopy
In situ subterranean determination of actinides by high-resolution gamma-ray spectrometry, 7:31817 (PNL-SA—8992)
URANIUM 235 TARGET
Sample Preparation
Preparation of thin targets of ^{239}Pu, ^{233}U and ^{235}U by the method of electrospraying, 7:32228 (AAEC/E—512)

URANIUM 238
Gamma Spectroscopy
In situ subterranean determination of actinides by high-resolution gamma-ray spectrometry, 7:31817 (PNL-SA—8992)
URANIUM 238 TARGET
Helium 3 Reactions
Duration of ^{238}U fission induced by ^{3}He, 7:32794 (JINR-R—15-80-762)
Photonuclear Reactions
Resonance scattering of 3-5 MeV γ-quanta emitted at radioactive decay, 7:32786 (JINR-R—15-81-151)
URANIUM CARBIDES
Post-Irradiation Examination
Investigations on swelling of U-PU mixed carbide, 7:32173 (KFK—3078)
Swelling
Investigations on swelling of U-PU mixed carbide, 7:32173 (KFK—3078)
URANIUM COMPOUNDS
Neutron Diffraction
Neutron scattering from spins and phonons in uranium compounds, 7:32819
URANIUM DEPOSITS
Aerial Prospecting
NURE aerial gamma-ray and magnetic detail survey: Mt. Leona-Nancy Creek, Washington area. Final report, 7:31782 (GJBX—182-Vol.2B(Mt.Leona))
NURE aerial gamma-ray and magnetic detail survey: Midnite-Sherwood Mines, Washington area. Final report, 7:31778 (GJBX—182-Vol.2B(Midnite))
NURE aerial gamma ray and magnetic detail survey of portions of northeast Washington. Final report, 7:31777 (GJBX—1-82)
Neutron-Neutron Logging
PFN tool test and calibration system (Prompt Fission Neutron), 7:31781 (SAND—80-0064)
URANIUM DIOXIDE
Density
Measurements of density and of thermal expansion coefficient of sodium tetraborate (borax)-UO_2 and of sodium metaborate-UO_2 solutions, 7:32174 (KFK—3088)
Fabrication
Manufacturing process of UO_2 pellets, 7:31939 (KAERI/RR—236/80)
Sintering
Uranium dioxide sintering kinetics and mechanisms under controlled oxygen potentials, 7:32235 (IEA-DT—141)
Thermal Expansion
Measurements of density and of thermal expansion coefficient of sodium tetraborate (borax)-UO_2 and of sodium metaborate-UO_2 solutions, 7:32174 (KFK—3088)
URANIUM ISOTOPES
Electromagnetic Isotope Separation
Electromagnetic mass separator for heavy element radioisotope separation, 7:31787 (RI—136)
URANIUM ORES
Gamma Detection
Field trial of CSIRO intrinsic germanium and natural gamma sirolog probes at AMDEL uranium calibration test pits, 7:31779 (INIS-mf—6752)
Gamma Logging
Field trial of CSIRO intrinsic germanium and natural gamma sirolog probes at AMDEL uranium calibration test pits, 7:31779 (INIS-mf—6752)
Leaching
Streamline-concentration balance model for in-situ uranium leaching and site restoration, 7:31783 (CRWR—180)
Solution Mining
Application of bacterial leaching technology to deep solution-mining conditions for uranium extraction. Final report, September 1, 1978-September 30, 1981, 7:31784 (NP—2902698)
Streamline-concentration balance model for in-situ uranium leaching and site restoration, 7:31783 (CRWR—180)
URANIUM OXIDES
See also URANIUM DIOXIDE
Sputtering
Target sputtering by multicharged heavy ion beams, 7:32711 (RI—120)
URANIUM RESERVES
Data Processing
Computerised information system for the processing of borehole data with regard to uranium sources in the Republic of South Africa, 7:31785 (PER—61)
Information Systems
Computerised information system for the processing of borehole data with regard to uranium sources in the Republic of South Africa, 7:31785 (PER—61)
URANYL COMPOUNDS
See also AUC
Raman Spectra
Raman spectroscopy study of hydroxo and carbonato species of the uranyl (VI) ion, 7:32238
URBAN AREAS
Transportation Systems
Interplay between urban pattern, traffic, and energy consumption. Report 1. The traffic behaviour, 7:32119 (NP—2900604)
US DOE
See also BONNEVILLE POWER ADMINISTRATION
HANFORD RESERVATION
HAPO
IDAHO NATIONAL ENGINEERING LABORATORY
LASL
LAWRENCE BERKELEY LABORATORY
LAWRENCE LIVERMORE LABORATORY
ORNL
ROCKY FLATS PLANT
SAVANNAH RIVER PLANT
SOLAR ENERGY RESEARCH INSTITUTE
Y-12 PLANT
Alpha-Bearing Wastes
Solid Waste Information Management System (SWIMS). Data summary, Fiscal Year 1980, 7:31794 (DOE/TIC—2005250)
Low-Level Radioactive Wastes
Solid Waste Information Management System (SWIMS). Data summary, Fiscal Year 1980, 7:31794 (DOE/TIC—2005250)
Program Management
Cost and Schedule Control Systems Criteria for Contract Performance Measurement: Systems Review/Surveillance Guide, 7:32910 (DOE/MA—0047)
Research Programs
Assessment of health, safety and environmental impacts of DOE coal conversion process. First technical progress report, 2 July 1980-31 March 1981, 7:31746 (DOE/ET/14746—1)
Federal energy R and D priorities. Report of the Research and Development Panel, Energy Research Advisory Board, 7:32083 (DOE/TIC—2007065)
USA
(For national information only. See individual states for specific references.)
See also APPALACHIA
PACIFIC NORTHWEST REGION
SOUTHWEST REGION
VIRGINIA
Energy Consumption
Growth of energy consumption and prices in the USA, FRG, France, and the UK, 1950-1979, 7:32110 (IIASA-WP—80-126)
Energy Policy
LMFBR designs for the twenty-first century, 7:31952
Gross National Product
Growth of energy consumption and prices in the USA, FRG, France, and the UK, 1950-1979, 7:32110 (IIASA-WP—80-126)
LMFBR Type Reactors
Development of a self-actuated shutdown system, 7:32038
LMFBR designs for the twenty-first century, 7:31952
Mineral Resources
Minerals critical to the development of future energy technologies in high and low solar scenarios, 7:32082 (LBL—13324)

Natural Gas Industry
1980 Legal Report of Oil and Gas Conservation Activities, 7:31754 (NP—2901180)
Petroleum Industry
1980 Legal Report of Oil and Gas Conservation Activities, 7:31754 (NP—2901180)
UTILITIES
See ELECTRIC UTILITIES
PUBLIC UTILITIES

V

VACUUM SYSTEMS
Ultrahigh Vacuum
UHV-test-section for SIS, 7:32329 (GSI—81-2)
VALVES
In-Service Inspection
Summary of ASME Section XI pump and valve testing program for nuclear power plants and an assessment of its effect on plant availability, 7:32059
Quality Assurance
Influence of quality assurance on valve design and manufacture, 7:32261
VANADIUM
Superconducting Junctions
Study of the tunnel junctions on vanadium base, 7:32149 (IAE—3338/10)
VANADIUM ALLOYS
Microstructure
Deuterium plasma-material wall interactions. Final report, 1 May 1979-30 September 1981, 7:32886 (DOE/ET/52008—2)
VANADIUM COMPLEXES
Catalytic Effects
Integrated approach to the systematic synthesis, characterization, and catalytic activity of novel heterogeneous catalysts. Final progress report, 7:32206 (DOE/ER/10381—3)
VANADIUM OXIDES
Differential Cross Sections
Inelastic neutron scattering study on crystal lattice dynamics of vanadium-oxygen interstitial solid solutions, 7:32171 (FEI—1109)
VEGETABLES
(Edible parts of plants only.)
Biological Accumulation
Heavy metal contents of leaf vegetables in relation to increasing amounts of garbage sewage sludge composts applied in pot experiments, 7:32503
Contamination
Iodine transfer from the ground into plants, 7:32509 (INIS-mf—6902)
Radionuclide Migration
Iodine transfer from the ground into plants, 7:32509 (INIS-mf—6902)
VEGETATION
See PLANTS
VEHICLES
See also AUTOMOBILES
ELECTRIC-POWERED VEHICLES
FLYWHEEL-POWERED VEHICLES
Energy Consumption
Interplay between urban pattern, traffic, and energy consumption. Report 2. The energy consumption of passenger traffic, 7:32120 (NP—2900605)
VERY HIGH FREQUENCY RADIATION
See RADIOWAVE RADIATION
VESSELS
See CONTAINERS
VESSELS (PRESSURE)
See PRESSURE VESSELS
VHF RADIATION
See RADIOWAVE RADIATION
VINYLBENZENE
See STYRENE
VIRGINIA
Severance Tax
Severance taxes on coal and uranium in the sunbelt, 7:31745
VK-50 REACTOR
District Heating
Technological testing of a district heating benchmark at the VK-50 reactor, 7:31958 (NIIAR—15(468))
VOLTAGE REGULATORS
Performance Testing
Characteristics of three voltage regulators at high temperatures, 7:32457 (SAND—82-0425)
Temperature Effects
Characteristics of three voltage regulators at high temperatures, 7:32457 (SAND—82-0425)
VOLTAIC CELLS
See ELECTRIC BATTERIES

W

WASHINGTON
Aerial Surveying
NURE aerial gamma-ray and magnetic detail survey: Midnite-Sherwood Mines, Washington area. Final report, 7:31778 (GJBX—182-Vol.2B(Midnite))
Magnetic Surveys
NURE aerial gamma-ray and magnetic detail survey: Mt. Leona-Nancy Creek, Washington area. Final report, 7:31782 (GJBX—182-Vol.2B(Mt.Leona))
NURE aerial gamma ray and magnetic detail survey of portions of northeast Washington. Final report, 7:31777 (GJBX—1-82)
Radiometric Surveys
NURE aerial gamma-ray and magnetic detail survey: Mt. Leona-Nancy Creek, Washington area. Final report, 7:31782 (GJBX—182-Vol.2B(Mt.Leona))
NURE aerial gamma-ray and magnetic detail survey: Midnite-Sherwood Mines, Washington area. Final report, 7:31778 (GJBX—182-Vol.2B(Midnite))
NURE aerial gamma ray and magnetic detail survey of portions of northeast Washington. Final report, 7:31777 (GJBX—1-82)
Uranium Deposits
NURE aerial gamma-ray and magnetic detail survey: Mt. Leona-Nancy Creek, Washington area. Final report, 7:31782 (GJBX—182-Vol.2B(Mt.Leona))
NURE aerial gamma-ray and magnetic detail survey: Midnite-Sherwood Mines, Washington area. Final report, 7:31778 (GJBX—182-Vol.2B(Midnite))
NURE aerial gamma ray and magnetic detail survey of portions of northeast Washington. Final report, 7:31777 (GJBX—1-82)
WASTE PROCESSING
See also RADIOACTIVE WASTE PROCESSING
Agglomeration
Liquid-waste immobilization by agglomeration, 7:31804 (PNL-SA—9739)
Solidification
Liquid-waste immobilization by agglomeration, 7:31804 (PNL-SA—9739)
WASTE WATER
Chemical Analysis
Chemical/biological characterization of SRC-II product and by-products, 7:31747 (PNL-SA—8813)
Mutagen Screening
Chemical/biological characterization of SRC-II product and by-products, 7:31747 (PNL-SA—8813)
Water Treatment
Design of fluidized-bed, biological denitrification systems, 7:32527 (ORNL/TM—7628)
WATER
See also GROUND WATER
SEAWATER
SURFACE WATERS

WASTE WATER
Density
Study of droplet formation for preparation of spheres by internal gelation, 7:31799 (ORNL/MIT—337)
Evaporation
Phase equilibrium properties of coal derived liquids. Technical progress report, July-December 1981, 7:31725 (DOE/PC/30230—23)
Mixtures
Saving fuel oil with fuel-blending and emulsifying systems, 7:32313
Phase Studies
Phase equilibrium properties of coal derived liquids. Technical progress report, July-December 1981, 7:31725 (DOE/PC/30230—23)
Surface Tension
Study of droplet formation for preparation of spheres by internal gelation, 7:31799 (ORNL/MIT—337)
Velocity
Measurement of local velocity in water with hot wire anemometers, 7:32279
Viscosity
Study of droplet formation for preparation of spheres by internal gelation, 7:31799 (ORNL/MIT—337)

WATER COOLED GRAPHITE MODERATED REACTORS
See LWGR TYPE REACTORS

WATER HEATERS
See also SOLAR WATER HEATERS
Heat Pumps
Comparison of heat pump water heaters and solar domestic water heaters, 7:32116 (SERI/TP—254-1482)
Life-Cycle Cost
Comparison of heat pump water heaters and solar domestic water heaters, 7:32116 (SERI/TP—254-1482)

WATER MODERATED REACTORS
See also BWR TYPE REACTORS
HFIR REACTOR
ORR REACTOR
PWR TYPE REACTORS
Reactor Kinetics
Update and benchmark test of the LEOPARD library from ENDF/B-IV, 7:31974 (KAERI/RR—201/80)

WATER POLLUTION
Environmental Impacts
Effects of pollution and the need for long-term monitoring, 7:32531
Metals
Sediments as criteria for water quality, 7:32529
Monitoring
Effects of pollution and the need for long-term monitoring, 7:32531
Pollution Regulations
Economic-impact study of proposed IPCB amendments to water-pollution regulations, R80-6. Document No. 82/06, 7:32096 (NP—2903327)

WATER QUALITY
Reviews
Effects of atmospheric deposition of energy-related pollutants on water quality: a review and assessment, 7:32478 (ANL/AA—26)

WATER RESOURCES
Environmental Issues Briefing Book sections concerning water quality and solid waste regulatory issues impacting DOE plans and programs, 7:32080 (DOE/EV/10025—T1)

WATER TREATMENT
Economics
Design of fluidized-bed, biological denitrification systems, 7:32527 (ORNL/TM—7628)

WEB GROWTH METHOD
See DENDRITIC WEB GROWTH METHOD

WECS
See WIND TURBINES

WELDED JOINTS
Liquid Penetrant Inspection
Testing of welds in hot state with a penetrant for high temperatures, 7:32289

WELDS
See WELDED JOINTS

WELL DRILLING
Safety
Drilling and operating oil, gas, and geothermal wells in an H_2S environment, 7:31892 (NP—2902054)
Technology Utilization
Influence of new technologies in wireline logging on the profitability of drilling projects, 7:32601

WELL LOGGING
See also NEUTRON-NEUTRON LOGGING
Technology Utilization
Influence of new technologies in wireline logging on the profitability of drilling projects, 7:32601

WELL LOGGING EQUIPMENT
Design
High-temperature acoustic borehole televiewer, 7:31890 (SAND—82-0425)
Electric Cables
Development of a metal sheath cable, 7:31888 (SAND—82-0425)
Fabrication
Commercial 200-275°C hybrids, 7:31885 (SAND—82-0425)

WELLS
See also GEOTHERMAL WELLS
NATURAL GAS WELLS
OIL WELLS
Water Tables
Ground-water levels in Alabama. For observation wells measured periodically, August 1952-July 1977. Circular 105, 7:32595 (NP—2902469)

WEST GERMANY
See FEDERAL REPUBLIC OF GERMANY

WEST VIRGINIA
Radioactive Waste Storage
Storage of low-level radioactive waste: a potential West Virginia alternative. Circular No. C-21, 7:31798 (NP—2902483)

WIND
Daily Variations
Modeling a multiple tracer release experiment during nocturnal drainage flow in complex terrain, 7:32491
Dynamic Loads
Contribution to the investigation of the STROUHAL number of high structures in natural wind for very high Reynolds numbers, 7:31901 (NP—2901105)
Measuring Methods
Nocturnal drainage flow over complex terrain using a generalized shallow fluid approximation, 7:32477
Shear
Dependence of vertical wind shear fluctuations on averaging times, 7:32475 (PNL-SA—8705)

WIND POWER
Resource Assessment
Virgin Islands wind energy siting analysis. Final report, 7:31897 (SSEC/TP—31262)

WIND POWER PLANTS
Control Systems
Variable gain for a wind turbine pitch control, 7:31898 (DOE/NASA/20320—34)

WIND TUNNELS
Particle Resuspension
Wind tunnel measurements of the resuspension of ideal particles, 7:32484

WIND TURBINES
Aerodynamics
Basic theoretical calculations of wind turbines, 7:31900 (Riso-M—2153)
Site Selection
Development of slide program describing site-selection process for Small Wind Energy Conversion Systems (SWECS), 7:31899 (DOE/R5/10301—1)
Virgin Islands wind energy siting analysis. Final report, 7:31897 (SSEC/TP—31262)
Stress Analysis
Basic theoretical calculations of wind turbines, 7:31900 (Riso-M—2153)

WOLF-RAYET STARS
Emission Spectra
Atlas of Wolf-Rayet line profiles, 7:32605 (JILA—117)
Shells
Iron curtain of the WC9 star HD 164270, 7:32682
Stellar Winds
Dependence of mass loss on the basic stellar parameters, 7:32680
Observations of stellar winds in early type stars, 7:32679
Velocity characteristics of WR stellar winds, 7:32681
WOLSUNG-1 REACTOR
Fuel Element Clusters
Nuclear fuel design. Design and fabrication of a CANDU-600 fuel 3-element bundle for an irradiation test, 7:31941 (KAERI/RR—242/80)
Fuel Pellets
Manufacturing process of UO_2 pellets, 7:31939 (KAERI/RR—236/80)
WOOD
Uses
Use of the biomass of black pine (Pinus nigra arn.) and locust (Robinia Pseudoacacia L.) as raw material for chip boards in consideration of whole-tree harvesting, 7:31842 (NP—2901104)
WOOD FUELS
Combustion
Economics and operating characteristics of various materials-handling systems and wood fuels in small- to medium-sized boilers. Final report, 7:32122 (DOE/ET/20618—T1)
Life-Cycle Cost
Analysis of life cycle costs of solar facilities, 7:32105 (LBL—13324)
WORKERS
See PERSONNEL
WORKING FLUIDS
Thermodynamic Properties
Thermodynamic characteristics of the ternary substance system methanol-lithium bromidee-zinc bromide, 7:32280
WWER-2 REACTOR
Fuel Assemblies
Combined iterative method for calculating the fuel burnup in nuclear reactors. Single-step kinetics, 7:31921 (ITEF—122(1980))
WYOMING
Geological Surveys
Thirty-ninth biennial report of the state geologist for 1979-1980, 7:32596 (NP—2902508)

X

X RADIATION
Synergism
Pathogenetic mechanism in lung fibrosis (Mice), 7:32585
XENON
Binding Energy
Weak binding gases as modulators of hemoglobin function, 7:32567
Electron-Molecule Collisions
Cross sections for electron impact ionisation of metastable rare-gas excimers ($He_2sup(*)$), ($Kr_2sup(*)$), ($Xe_2sup(*)$), 7:32712
XENON 131 TARGET
Hadron Reactions
Hadron-nucleon inelastic collision mean free path in nuclear matter, 7:32777 (JINR—E-1-80-799)
X-RAY DETECTION
Meetings
Proceedings of the plan meetings on x-ray instrumentation for the photon factory, Tsukuba, March to September, 1979, 7:32352 (KEK—79-34)
X-RAY FLUORESCENCE ANALYSIS
Effects of X-ray absorption in the analysis of thick target samples by XRF, 7:32202 (PUC-tn—22/80)
X-RAY SOURCES
Meetings
Proceedings of the plan meetings on x-ray instrumentation for the photon factory, Tsukuba, March to September, 1979, 7:32352 (KEK—79-34)
X-RAY SPECTROMETERS
Bragg Reflection
Eight crystal X-ray spectrometer, 7:32446 (GSI—81-2)
Experimental setup for high resolution Auger electron and X-ray spectroscopy, 7:32447 (GSI—81-2)
Position Sensitive Detectors
Application of a position sensitive proportional counter for an X-ray transmission spectrometer, 7:32380 (GSI—81-2)
Proportional Counters
Application of a position sensitive proportional counter for an X-ray transmission spectrometer, 7:32380 (GSI—81-2)
XYLOSE
Biosynthesis
Enzymatic hydrolysis of cellulose: theory and applications, 7:31829 (LBL—13669)

Y

Y-12 PLANT
Buildings
Report of investigation, first floor slab in ORNL building 9204-1, Y-12 plant, 7:32256 (Y/EN—611)
YEREVAN SYNCHROTRON
See EREVAN SYNCHROTRON
YTTRIUM 88
Radionuclide Kinetics
Distribution in rats after intravenous injection of ^{88}Y compounds, 7:32564
YTTRIUM OXIDES
Sintering
Solid state formation of $Y_3Al_5O_{12}$, 7:32172 (IA—1364)

Z

ZERO POWER REACTORS
See also ORNL-PCA REACTOR
In Core Instruments
On-line system for study of the physical performances of the BFS critical assemblies on the M-6000 computer basis, 7:31999 (FEI—1022)
Microprocessors
On-line system for study of the physical performances of the BFS critical assemblies on the M-6000 computer basis, 7:31999 (FEI—1022)
Multiplication Factors
Test calculations of physical parameters of the TRX,BETTIS and MIT critical assemblies according to the TRIFON program, 7:31971 (ITEF—164(1980))
Neutron Flux
Test calculations of physical parameters of the TRX,BETTIS and MIT critical assemblies according to the TRIFON program, 7:31971 (ITEF—164(1980))
ZINC
Leaching
Trace element characterization of coal wastes. Fifth annual progress report, October 1, 1979-September 30, 1980, 7:31728 (LA—8826-PR)
ZINC 65
Biological Availability
Transfer of the corrosion nuclides ^{59}Fe, ^{54}Mn, ^{65}Zn, and ^{60}Co from ground to vegetation, 7:32514 (INIS-mf—6902)
Radionuclide Migration
Transfer from vegetation to meat, 7:32519 (INIS-mf—6902)

Transfer of the corrosion nuclides ^{59}Fe, ^{54}Mn, ^{65}Zn, and ^{60}Co from ground to vegetation, 7:32514 (INIS-mf—6902)

ZINC PHOSPHATES
Optical Properties
Optical properties of Nd^{3+} in metaphosphate glasses, 7:32187

ZIRCALOY
Creep
Transient deformation properties of Zircaloy for LOCA simulation. Final report, 7:32017 (EPRI-NP—526-Vol.4,Pt.2)
Deformation
Transient deformation properties of Zircaloy for LOCA simulation. Final report, 7:32017 (EPRI-NP—526-Vol.4,Pt.2)
Fabrication
Fabrication characteristics of Zircaloy tubes for nuclear reactors (Destructive testing, quality control), 7:31978 (CNEN-DIN—01/80)

ZIRCONIUM
Charged-Particle Transport
Stopping power measurements with the modified UNILAC TOF-system, 7:32808 (GSI—81-2)
Electric Conductivity
Electric conductivity of titanium, zirconium, hafnium and its alloys. Communication 1, 7:32147 (FEI—1149)
Self-Diffusion
Model of diffusion of metals. 2. Effect of polymorphic transformations on self-diffusion parameters, 7:32232 (FEI—1094)

ZIRCONIUM 90 TARGET
Charge-Exchange Reactions
Charge-exchange Gamow-Teller and dipole resonances in ^{90}Zr, 7:32773 (IFUSP-P—225)

ZIRCONIUM 92 TARGET
Proton Reactions
Direct experimental evidence for strong sequential two-step transfer process in allowed (p,t) reactions, 7:32782 (UTTAC—38)

ZIRCONIUM ALLOYS
See also ZIRCONIUM BASE ALLOYS
Solubility
Impurities diffusion in binary titanium-zirconium and titanium-aluminium alloys in a bcc solid-solution range, 7:32146 (FEI—1145)

ZIRCONIUM BASE ALLOYS
See also ZIRCALOY
Electric Conductivity
Electric conductivity of titanium, zirconium, hafnium and its alloys. Communication 1, 7:32147 (FEI—1149)

ZIRCONIUM ISOTOPES
Charge-Exchange Reactions
Energy splitting between the $T=T_0$ and $T=T_0$-1 components of the charge-exchange vector dipole resonance, 7:32774 (IFUSP-P—246)

ZIRCONIUM OXIDES
Fracture Properties
Thermodynamics of phase-transformation toughening, 7:32170 (DOE/ER/10856—1)
Phase Transformations
Thermodynamics of phase-transformation toughening, 7:32170 (DOE/ER/10856—1)
Sorptive Properties
Adsorption of technetium on selected inorganic ion-exchange materials and on a range of naturally occurring minerals under oxic conditions, 7:32244

CONTRACT NUMBER INDEX

Numbers assigned to DOE contracts under which reports announced in this publication were prepared are included in this index.

Contract No.	Abstract No.	Report No.
AC01-76EV03759		**Dames and Moore, White Plains, NY (USA)**
	7:31816	DOE/EV/03759—T1
AC01-79CS20295		**XENERGY, Inc., Burlington, MA (USA)**
	7:32121	DOE/CS/20295—1
AC01-79CS30027		**Automation Industries, Inc., Silver Spring, MD (USA). Vitro Labs. Div.**
	7:31874	SOLAR/0909—81/70
AC01-80ET14746		**Carnegie-Mellon Inst. of Research, Pittsburgh, PA (USA)**
	7:31746	DOE/ET/14746—1
AC01-81FE00080		**Bituminous Coal Research, Inc., Monroeville, PA (USA)**
	7:31733	DOE/FE/00080—2
AC02-76CH00016		**Brookhaven National Lab., Upton, NY (USA)**
	7:31771	BNL—30440
	7:31866	BNL—30441
	7:32108	BNL—51418
	7:32177	BNL—51390
	7:32327	BNL—30337
	7:32472	BNL—30322
	7:32479	BNL—27818
	7:32540	BNL—30551
	7:32586	BNL—30356
	7:32752	BNL—30432
AC02-76CH03000		**Fermi National Accelerator Lab., Batavia, IL (USA)**
	7:32724	FERMILAB-Conf—81/80-Exp.
AC02-76ER01198		**Illinois Univ., Urbana (USA)**
	7:32828	DOE/ER/01198—1372
AC02-76ET20279		**Massachusetts Inst. of Tech., Lexington (USA). Lincoln Lab.**
	7:31855	DOE/ET/20279—153
AC02-77CH00178		**Solar Energy Research Inst., Golden, CO (USA)**
	7:31840	DOE/TIC—2006904
		Westinghouse Electric Corp., Pittsburgh, PA (USA). Research and Development Center
	7:31851	SERI/PR—8143-1-T5
		Solar Energy Research Inst., Golden, CO (USA)
	7:31852	SERI/PR—9195-1-T3
	7:31853	SERI/TP—211-1494
		Solar Thermal Test Facilities Users Association, Albuquerque, NM (USA)
	7:31872	SERI—0637-4
		Solar Energy Research Inst., Golden, CO (USA)
	7:31873	SERI/TR—663-1032
	7:32116	SERI/TP—254-1482
AC02-77ET52018		**Westinghouse Research and Development Center, Pittsburgh, PA (USA)**
	7:32887	DOE/ET/52018—16
AC02-78ER04996		**GTE Labs., Inc., Waltham, MA (USA)**
	7:31877	DOE/ER/04996—2
AC02-78ER10107		**Massachusetts Inst. of Tech., Cambridge (USA)**
	7:32139	DOE/ER/10107—5
AC02-78ET21002		**VSE Corp., Alexandria, VA (USA)**
	7:31865	DOE/ET/21002—T21
AC02-78ET51013		**Massachusetts Inst. of Tech., Cambridge (USA). Plasma Fusion Center**
	7:32848	DOE/ET/51013—27
AC02-78EV04776		**Univ. of Colorado, Boulder**
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AC02-79ER10516		**Michigan State Univ., East Lansing (USA). Dept. of Physics**
	7:32723	DOE/ER/10516—10
AC02-79EV10025		**Hart (Fred C.) Associates, Inc., New York (USA)**
	7:32080	DOE/EV/10025—T1
AC02-80CS83004		**Institute of Gas Technology, Chicago, IL (USA)**
	7:31835	CONF-810865—10
AC02-80ER10556		**Brown Univ., Providence, RI (USA)**
	7:32143	DOE/ER/10556—86
AC02-80ER10575		**Chicago Univ., IL (USA)**
	7:31878	DOE/ER/10575—2
AC02-80ET29310		**General Electric Co., Schenectady, NY (USA)**
	7:31857	DOE/ET/29310—1
AC02-80ET34030		**Combustion Engineering, Inc., Windsor, CT (USA)**
	7:32014	DOE/ET/34030—1
AC02-80EV10380		**Cincinnati Univ., OH (USA)**
	7:32231	DOE/EV/10380—2
AC02-81ER10856		**Rochester Univ., NY (USA). Dept. of Mechanical Engineering**
	7:32170	DOE/ER/10856—1
AC02-81ER40033		**Rockefeller Univ., New York (USA)**
	7:32369	DOE/ER/40033—13
AC02-81EV10610		**New York Univ., NY (USA). Dept. of Applied Science**
	7:32473	DOE/EV/10610—01
AC03-76CS51213		**AiResearch Mfg. Co., Los Angeles, CA (USA)**
	7:32128	DOE/CS/51213—T20
AC03-76ET53057		**Science Applications, Inc., Boulder, CO (USA). Plasma Research Inst.**
	7:32877	SAI—254-81-387-LJ
AC03-76SF00012		**California Univ., Los Angeles (USA). Lab. of Biomedical and Environmental Sciences**
	7:31863	UCLA—12/1311
AC03-76SF00515		**Stanford Linear Accelerator Center, CA (USA)**
	7:32926	SLAC-PUB—2835
AC03-79SF10763		**Energy Foundation of Texas, Houston (USA)**
	7:31861	DOE/SF/10763—T13
AC03-81SF11436		**Booz, Allen and Hamilton, Inc., Bethesda, MD (USA)**
	7:31862	DOE/SF/11436—1-Exect.Summ.
AC04-76DP00053		**Mound Facility, Miamisburg, OH (USA)**
	7:31718	MLM-MU—81-72-0002
	7:31796	MLM-MU—81-72-0003-Vol.1
	7:31825	MLM—2884
AC04-76DP00613		**Bendix Corp., Kansas City, MO (USA)**
	7:32132	BDX—613-2730
	7:32248	BDX—613-2722
AC04-76DP00789		**Sandia National Labs., Albuquerque, NM (USA)**
	7:31781	SAND—80-0064
	7:31808	SAND—81-1048
	7:31809	SAND—81-1882

Contract No.	Abstract No.	Report No.
	Brookhaven National Lab., Upton, NY (USA)	
	7:31834	SAND—81-7027
	Sandia National Labs., Albuquerque, NM (USA)	
	7:31858	SAND—81-0135-Rev.1
	7:31859	SAND—81-7086/5
	7:31860	SAND—81-7090/4
	7:32033	SAND—80-2627
	7:32160	SAND—81-1952
	7:32184	SAND—81-2567
	7:32185	SAND—82-0025C
	7:32847	SAND—81-1729C
	Sandia Labs., Albuquerque, NM (USA)	
	7:32922	SAND—80-2056
	Sandia National Labs., Albuquerque, NM (USA)	
	7:32923	SAND—81-1927
	7:32924	SAND—81-2476
	7:32925	SAND—82-0061C
AC04-76DP03533	**Rockwell International Corp., Golden, CO (USA). Rocky Flats Plant**	
	7:32505	CONF-8110125—1
AC04-81AL16223	**Chicago Univ., IL (USA). Enrico Fermi Inst.**	
	7:31876	DOE/AL/16223—1
AC05-76OR00033	**Oak Ridge Associated Universities, Inc., TN (USA)**	
	7:31788	ORAU—190
AC05-76OR01156	**Nntional Lead Co. of Ohio, Cincinnati (USA)**	
	7:31797	NLCO—008EV
AC06-76RL01830	**Pacific Northwest Lab., Richland, WA (USA)**	
	7:31719	PNL-SA—9020
	7:31730	PNL-SA—9806
	7:31747	PNL-SA—8813
	7:31776	PNL-SA—9805
	7:31792	PNL-SA—10022
	7:31800	PNL-SA—8408
	7:31801	PNL-SA—8604
	7:31802	PNL-SA—8927
	7:31803	PNL-SA—9440
	7:31804	PNL-SA—9739
	7:31805	PNL-SA—10019
	7:31817	PNL-SA—8992
	7:31818	PNL-SA—9503
	7:31831	PNL-SA—9057
	7:31849	PNL-SA—9975
	7:31850	PNL-SA—9982
	7:31918	PNL-SA—9100
	7:31948	PNL-SA—9441
	7:32067	PNL-SA—9891
	7:32158	PNL-SA—9759
	7:32200	PNL-SA—8945
	7:32461	
	7:32462	
	7:32463	
	7:32470	PNL-SA—9630
	7:32475	PNL-SA—8705
	7:32480	PNL-SA—9311
	7:32498	PNL-SA—9014
	7:32572	PNL-SA—9133
	7:32602	PNL-SA—9848
	7:32921	PNL-SA—9984
AC06-77RL01030	**Rockwell International Corp., Richland, WA (USA). Rockwell Hanford Operations**	
	7:31806	RHO-BWI-C—86
	7:31807	RHO-LD—165
	7:32534	RHO-SA—216
AC07-76ID01570	**EG and G Idaho, Inc., Idaho Falls (USA)**	
	7:31794	DOE/TIC—2005250
	7:31841	EGG-M—04481
	7:31893	CONF-810812—42
	7:32016	EGG-M—02381
	7:32845	CONF-810842—3
	Idaho National Engineering Lab., Idaho Falls (USA)	
	7:32879	CONF-810801—59
	EG and G Idaho, Inc., Idaho Falls (USA)	
	7:32880	CONF-810831—80
AC08-79BC10003	**CER Corp., Las Vegas, NV (USA)**	
	7:31768	DOE/BC/10003—19

Contract No.	Abstract No.	Report No.
AC09-76SR00001	**Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Lab.**	
	7:32497	DP-MS—81-72
AC13-76GJ01664	**Carson Helicopters, Inc., Perkasie, PA (USA)**	
	7:31777	GJBX—1-82
	Bendix Field Engineering Corp., Grand Junction, CO (USA)	
	7:31778	GJBX—182-Vol.2B(Midnite)
	7:31782	GJBX—182-Vol.2B(Mt.Leona)
AC19-79BC10043	**Southwest Research Inst., San Antonio, TX**	
	7:31756	American Society for Testing and Materials, Special Technical Publication NO. 751. 3-21 (1
AC21-80MC14036	**Princeton Univ., NJ (USA). Dept. of Mechanical and Aerospace Engineering**	
	7:32305	DOE/MC/14036—T1
AC22-76ET13354	**Mathtech, Inc., Princeton, NJ (USA)**	
	7:31732	DOE/ET/13354—T1
AC22-81PC40270	**Aerojet Energy Conversion Co., Sacramento, CA (USA)**	
	7:31741	DOE/PC/40270—3
AI01-76ET20320	**National Aeronautics and Space Administration, Cleveland, OH (USA). Lewis Research Center**	
	7:31898	DOE/NASA/20320—34
AI01-76ET20356	**Jet Propulsion Lab., Pasadena, CA (USA)**	
	7:31838	DOE/JPL—1012-61
	7:31856	DOE/ET/20356—5
AI01-77CS51044	**National Aeronautics and Space Administration, Cleveland, OH (USA). Lewis Research Center**	
	7:32131	DOE/NASA/0124—6
AI01-77ET10769	**National Aeronautics and Space Administration, Cleveland, OH (USA). Lewis Research Center**	
	7:32109	DOE/NASA/10769—21
AI01-78CS54209	**Jet Propulsion Lab., Pasadena, CA (USA)**	
	7:32129	DOE/CS/54209—4
AI03-80SF10838	**Acurex Corp., Mountain View, CA (USA). Energy and Environmental Div.**	
	7:31895	DOE/SF/10838—T1
AS02-76ER02026	**Minnesota Univ., Minneapolis (USA). Dept. of Chemical Engineering and Materials Science**	
	7:32222	DOE/ER/02026—41
AS02-76ER02313	**Colorado School of Mines, Golden (USA)**	
	7:32135	DOE/ER/02313—11
AS02-76ER02383	**Illinois Univ., Urbana (USA). Dept. of Computer Science**	
	7:32304	UIUCDCS-R—81-1072
	7:32930	UIUCDCS-R—81-1064
AS02-76ER02640	**Minnesota Univ., Minneapolis (USA)**	
	7:32693	DOE/ER/02640—13
AS02-76ER02892	**Nebraska Univ., Lincoln (USA). Behlen Lab. of Physics**	
	7:32694	DOE/ER/02892—29
	Nebraska Univ., Lincoln (USA)	
	7:32695	DOE/ER/02892—30
AS02-76ER03285	**Johns Hopkins Univ., Baltimore, MD (USA). Dept. of Physics**	
	7:32722	DOE/ER/03285—40
	7:32738	DOE/ER/03285—41
AS02-76ET37237	**Purdue Univ., Lafayette, IN (USA). School of Nuclear Engineering**	
	7:32008	PNE—81-150
AS02-77ER04433	**Northwestern Univ., Evanston, IL (USA). Dept. of Mechanical and Nuclear Engineering**	
	7:32246	DOE/ER/04433—5
AS02-77ET20091	**Carnegie-Mellon Univ., Pittsburgh, PA (USA)**	
	7:32104	DOE/ET/20091—1

Contract No.	Abstract No.	Report No.
AS02-77ET52008	Columbia Univ., New York (USA). Plasma Physics Lab.	
	7:32886	DOE/ET/52008—2
AS02-77EV04500	New York Univ., NY (USA). Dept. of Physics	
	7:32697	DOE/EV/04500—2
AS02-78CS40222	Purdue Univ., Lafayette, IN (USA)	
	7:31723	DOE/CS/40222—2
AS02-78ER00913	Minnesota Univ., Minneapolis (USA)	
	7:32221	DOE/ER/00913—2
AS02-78ER04861	Wisconsin Univ., Madison (USA). Dept. of Nuclear Engineering	
	7:32136	DOE/ER/04861—3
AS02-78ER04949	Massachusetts Inst. of Tech., Cambridge (USA)	
	7:32215	DOE/ER/04949—1
AS02-78ER10107	Massachusetts Inst. of Tech., Cambridge (USA)	
	7:32137	DOE/ER/10107—3
	7:32138	DOE/ER/10107—4
	7:32140	DOE/ER/10107—7
	7:32141	DOE/ER/10107—9
	7:32881	DOE/ER/10107—6
	7:32882	DOE/ER/10107—8
	7:32883	DOE/ER/10107—10
	7:32884	DOE/ER/10107—11
	7:32885	DOE/ER/10107—12
AS02-78EV04962	Brandeis Univ., Waltham, MA (USA)	
	7:32541	DOE/EV/04962—3
AS02-79ER10381	Wayne State Univ., Detroit, MI (USA)	
	7:32206	DOE/ER/10381—3
AS02-79ER10389	Massachusetts Inst. of Tech., Cambridge (USA). Dept. of Mechanical Engineering	
	7:32142	DOE/ER/10389—2
AS05-76ER03346	Georgia Inst. of Tech., Atlanta (USA). School of Chemistry	
	7:32787	DOE/ER/03346—T1
AS05-76ER04447	Tennessee Univ., Knoxville (USA). Dept. of Chemistry	
	7:32230	DOE/ER/04447—137
AS05-76ER04699	Louisiana State Univ. and Agricultural and Mechanical Coll., Baton Rouge (USA)	
	7:32604	DOE/ER/04699—7
AS05-76ER05224	Texas Univ., Austin (USA). Dept. of Physics	
	7:32761	DOE/ER/05224—5
AS05-81ER10890	Texas Univ., Austin (USA). Dept. of Physics	
	7:32829	DOE/ER/10890—1
AS05-81ER40039	Texas A and M Univ., College Station (USA). Dept. of Physics	
	7:32358	DOE/ER/40039—1
AS09-76EV00936	Skidaway Inst. of Oceanography, Savannah, GA (USA)	
	7:32603	DOE/EV/00936—T3
AT03-76ER70019	University of Southern California, Los Angeles (USA). Dept. of Electrical Engineering	
	7:32816	USC—113P19-77
	7:32931	USC—113P19-78
	7:32932	USC—113P-66
AT03-76ET12074	SRI International, Menlo Park, CA (USA)	
	7:31769	DOE/ET/12074—T1
	7:31770	DOE/ET/12074—T3
AT03-76ET35300	General Atomic Co., San Diego, CA (USA)	
	7:31937	GA-A—16558
AT03-76ET53025	SRI International, Menlo Park, CA (USA)	
	7:32696	DOE/ET/53025—T10
AT03-76SF70046	General Atomic Co., San Diego, CA (USA)	
	7:32018	GA-A—16467
EC-78-C-01-5162	Ceramatec, Inc., Salt Lake City, UT (USA)	
	7:32068	CONF-790526—3
	7:32069	CONF-8009134—2
EX-76-C-01-2211	Kansas State Univ., Manhattan	
	7:32205	Journal of Catalysis 73 NO. 2. 216-227 (Feb 1982).
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FC03-80RA50076	Arizona Solar Energy Commission, Phoenix (USA)	
	7:31881	DOE/RA/50076—T12
FC07-80ID12200	Allis-Chalmers Corp., York, PA (USA). Hydro-Turbine Div.	
	7:31832	DOE/ID/12200—T1
FG01-78ET20618	North Carolina State Univ., Raleigh (USA). School of Forest Resources	
	7:32122	DOE/ET/20618—T1
FG02-80ER10727	Ohio State Univ., Columbus (USA)	
	7:31998	DOE/ER/10727—T1
FG02-80IR10905	Minnesota Environmental Sciences Foundation, Inc., Minneapolis (USA)	
	7:32125	DOE/IR/10905—20
FG02-80R510222	Indiana Biolab, Palmyra (USA)	
	7:31839	DOE/R5/10222—1
FG02-81R510301	Ball State Univ., Muncie, IN (USA). Wind Energy Research Team	
	7:31899	DOE/R5/10301—1
FG22-80PC30216	Washington State Univ., Pullman (USA). Dept. of Mechanical Engineering	
	7:31740	DOE/PC/30216—T3
FG22-80PC30222	Purdue Univ., Lafayette, IN (USA). School of Chemical Engineering	
	7:31724	DOE/PC/30222—T2
FG22-80PC30230	Colorado School of Mines, Golden (USA). Dept. of Chemical and Petroleum Refining Engineering	
	7:31725	DOE/PC/30230—23
FG22-81PC40778	West Virginia Univ., Morgantown (USA). Dept. of Chemical Engineering	
	7:31716	DOE/PC/40778—T1
FG22-81PC40793	Western Kentucky Univ., Bowling Green (USA)	
	7:31726	DOE/PC/40793—T1
FG22-81PC40797	Rhode Island Univ., Kingston (USA)	
	7:31717	DOE/PC/40797—1
W-31-109-ENG-38		
	7:31737	
	7:31738	
	Argonne National Lab., IL (USA)	
	7:31864	ANL/OTEC-BCM—023
	7:32127	ANL/OEPM—81-7
	7:32478	ANL/AA—26
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W-7405-ENG-26	Oak Ridge National Lab., TN (USA)	
	7:31789	ORNL/TM—8030
	Massachusetts Inst. of Tech., Oak Ridge, TN (USA). School of Chemical Engineering Practice	
	7:31848	ORNL/MIT—336
	Trident Engineering Associates, Inc., Annapolis, MD (USA)	
	7:31902	ORNL/SUB—7435/1
	7:31903	ORNL/Sub—7435/2
	Oak Ridge National Lab., TN (USA)	
	7:31916	NUREG/CR—2408
	7:31917	ORNL/SUB—7537/15
	7:31929	NUREG/CR—2204-Vol.3
	7:31943	CONF-811103—69
	7:31956	ORNL/TM—8061
	7:31959	CONF-811103—68

Contract No.	Abstract No.	Report No.
	Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Inst. fuer Neutronenphysik und Reaktortechnik	
	7:31975	ORNL-tr—4797(Sep 1980).
	Oak Ridge National Lab., TN (USA)	
	7:32004	ORNL/TM—7841
	7:32005	ORNL/TM—7978
	7:32006	ORNL/TM—7979
	7:32007	ORNL/TM—8029
	7:32011	ORNL/TM—8147
	7:32012	ORNL/TM—8169
	7:32091	CONF-801152—3
	Energy Utilization Systems, Inc., Pittsburgh, PA (USA)	
	7:32099	EPRI-EM—2193-Vol.3
	Oak Ridge Y-12 Plant, TN (USA)	
	7:32161	Y/DW—282
	7:32204	Y/DK—285
	Oak Ridge National Lab., TN (USA)	
	7:32234	IAEA-CN—40/74P
	Oak Ridge Y-12 Plant, TN (USA)	
	7:32255	Y—2264
	Oak Ridge National Lab., TN (USA)	
	7:32256	Y/EN—611
	7:32526	NUREG/CR—2220-Vol.1
	7:32527	ORNL/TM—7628
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	Westinghouse Electric Corp., Pittsburgh, PA (USA). Fusion Programs Dept.	
	7:32901	ORNL/Sub—81/21086/2
	Oak Ridge National Lab., TN (USA)	
	7:32913	CONF-811214—6
	7:32920	ORNL/CSD/TM—166
W-7405-ENG-36	**Los Alamos National Lab., NM (USA)**	
	7:31728	LA—8826-PR
	7:31750	LA—8983
	7:31795	LA—8959-PR
	Oak Ridge National Lab., TN (USA)	
	7:31799	ORNL/MIT—337
	Los Alamos National Lab., NM (USA)	
	7:31819	LA—8870-PR
	7:31820	LA—9002-MS
	7:31869	LA—9071-MS
	7:31879	LA-UR—81-3610
	7:31928	LA—9125-MS
	7:31955	LA—9052-MS
	7:32130	LA-UR—81-3071
	7:32276	LA—8872
	7:32325	LA-UR—81-3057
	7:32326	LA-UR—81-3058
	7:32474	LA-UR—81-3573
	7:32587	LA-UR—81-3204
	7:32594	LA-UR—81-3700
	7:32754	LA-UR—81-3636
	7:32795	LA—9026
	7:32835	LA—9121-MS
	7:32836	LA-UR—81-3590
	7:32919	LA-UR—81-3558
W-7405-ENG-48	**Lawrence Livermore National Lab., CA (USA)**	
	7:31720	UCID—19280
	7:31822	UCRL—86160
	Lawrence Berkeley Lab., CA (USA)	
	7:31829	LBL—13669
	Lawrence Livermore National Lab., CA (USA)	
	7:31882	UCRL—15423
	7:31896	UCID—19291
	Lawrence Berkeley Lab., CA (USA)	
	7:32112	LBL—13400
	7:32156	LBL—13623
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	Lawrence Livermore National Lab., CA (USA)	
	7:32237	UCRL—85944
	7:32254	UCRL—86438
	7:32354	LBL-PUB—426
	Creare Products, Inc., Lebanon, NH (USA)	
	7:32458	UCRL—15426-Vol.1
	7:32459	UCRL—15426-Vol.2
	Lawrence Livermore National Lab., CA (USA)	
	7:32469	UCID—18253
	7:32481	UCID—19300
	7:32542	International Review of Cytology 70 27-100 (1981).
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	Lawrence Berkeley Lab., CA (USA)	
	7:32709	LBL—13593
	7:32737	Lettere al Nuovo Cimento 28 NO. 3. 85-88 (17 May 1980).
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	Lawrence Livermore National Lab., CA (USA)	
	7:32902	UCID—19206
	7:32903	UCRL—87037
	7:32904	UCRL—87038
	7:32927	UCID—19268
	7:32928	UCRL—86341
	7:32929	UCRL—86500

REPORT NUMBER INDEX

The numbers assigned to all reports cited in the publication appear in the first column of the index. Cross reference information and/or availability are included as appropriate. Abbreviations used in the availability column are elaborated at the end of the index. To expedite the filing of orders for reports from NTIS and TIC, an order number in the form, DE810000001, appears in column 3. Requesters are urged to use this order number where provided. In column 4, one or more DOE distribution categories are indicated, e.g. , STD-10, MN-25. STD indicates distriburion was made in full size copy; MN indicates microcopy distribution. These category numbers are included to assist DOE librarians in responding to requests for reports in their collections. The UC (Unclassified Distribution Categories) are defined in DOE/TIC-4500, available from TIC. The Citation numbers are given in column 5.

Report No.	*Availability*	*Order No.*	*Distribution Category*	*Abstract No.*
AAEC/E-				
512	NTIS (US Sales Only), PC A02/MF A01	DE82700247	MN -4	7:32228
AECL-				
7523-Vol.1	Chalk River Nuclear Laboratory, Chalk River, Ontario, Canada KOJ 1JO		ND -37	7:32442
AECP-				
8(Pt.2)	NTIS (US Sales Only), PC A06/MF A01	DE82700407	MN -37	7:32367
AEEW-M-				
1830	NTIS (US Sales Only), PC A05/MF A01	DE81700999	MN -80	7:31976
AERE-PR/TP-				
37	NTIS (US Sales Only), PC A07/MF A01	DE82700072	MN -34A	7:32824
AERE-R-				
9986	NTIS (US Sales Only), PC A03/MF A01	DE82700074	MN -34A	7:32688
10095	NTIS (US Sales Only), PC A04/MF A01	DE82901337	STD -79h	7:31942
10206	NTIS (US Sales Only), PC A02/MF A01	DE82700191	MN -34C	7:32368
10207	NTIS (US Sales Only), PC A02/MF A01	DE82700073	MN -34A	7:32443
AERE-TP-				
876	NTIS (US Sales Only), PC A10/MF A01	DE82700075	MN -34A	7:32689
ANL/AA-				
26	NTIS, PC A05/MF A01	DE82007036	STD -11	7:32478
ANL/OEPM-				
81-7	NTIS, PC A03/MF A01	DE82007032	STD -94ca	7:32127
ANL/OTEC-BCM-				
023	NTIS, PC A07/MF A01	DE82007037	STD -64	7:31864
ARL/TR-				
034	NTIS (US Sales Only), PC A07/MF A01	DE82700254	MN -4	7:32229
037	NTIS (US Sales Only), PC A03/MF A01	DE82700282	MN -51	7:32504
ASTM-STP-				
751	American Society for Testing and Materials, 1916 Race St., Philadelphia, PA 19103			7:31755
751	Am. Soc. Test. Mater., Spec. Tech. Publ., No. 751, 3-21(1981)			7:31756
751	Am. Soc. Test. Mater., Spec. Tech. Publ., No. 751, 22-33(1981)			7:31757
751	Am. Soc. Test. Mater., Spec. Tech. Publ., No. 751, 34-46(1981)			7:31758
751	Am. Soc. Test. Mater., Spec. Tech. Publ., No. 751, 47-59(1981)			7:31759
751	Am. Soc. Test. Mater., Spec. Tech. Publ., No. 751, 60-75(1981)			7:31760
751	Am. Soc. Test. Mater., Spec. Tech. Publ., No. 751, 103-125(1981)			7:31761
751	Am. Soc. Test. Mater., Spec. Tech. Publ., No. 751, 126-135(1981)			7:31762
751	Am. Soc. Test. Mater., Spec. Tech. Publ., No. 751, 136-144(1981)			7:31763
751	Am. Soc. Test. Mater., Spec. Tech. Publ., No. 751, 92-102(1981)			7:31764
751	Am. Soc. Test. Mater., Spec. Tech. Publ., No. 751, 145-156(1981)			7:31765
751	Am. Soc. Test. Mater., Spec. Tech. Publ., No. 751, 76-83(1981)			7:31775
751	Am. Soc. Test. Mater., Spec. Tech. Publ., No. 751, 84-91(1981)			7:31828
BDX-				
613-2722	NTIS, PC A02/MF A01	DE82007626	MN -38	7:32248
613-2730	NTIS, PC A04/MF A01	DE82007645	MN -25	7:32132
BMFT-FB-T-				
81-009	NTIS (US Sales Only), PC A10/MF A01	DE82780287	MN -38	7:32844
BNL-				
27818	NTIS, PC A05/MF A01	DE82005695	MN -11	7:32479
30322	NTIS, PC A02/MF A01	DE82005503	MN -11	7:32472
30337	NTIS, PC A02/MF A01	DE82005236	MN -32	7:32327

Report No.	Availability	Order No.	Distribution Category	Abstract No.
30356	NTIS, PC A02/MF A01	DE82005509	MN -48	7:32586
30432	NTIS, PC A02/MF A01	DE82005502	MN -34D	7:32752
30440	NTIS, PC A02/MF A01	DE82006933	MN -92	7:31771
30441	NTIS, PC A02/MF A01	DE82006932	MN -59c	7:31866
30551	NTIS, PC A02/MF A01	DE82005511	MN -48	7:32540
51390	NTIS, PC A07/MF A01	DE82010994	STD -25	7:32177
51418	NTIS, PC A10/MF A01	DE82006841	STD -94d	7:32108
CBPF-A-				
0004/ 80	NTIS (US Sales Only), PC A02/MF A01	DE82700082	MN -34A	7:32690
0005/ 80	NTIS (US Sales Only), PC A02/MF A01	DE82700076	MN -34A	7:32691
0007/ 80	NTIS (US Sales Only), PC A03/MF A01	DE82700083	MN -34A	7:32692
0010/ 80	NTIS (US Sales Only), PC A02/MF A01	DE82700084	MN -34A	7:32825
0013/ 80	NTIS (US Sales Only), PC A03/MF A01	DE82700085	MN -34A	7:32826
0017/ 80	NTIS (US Sales Only), PC A02/MF A01	DE82700077	MN -34A	7:32133
0021/ 80	NTIS (US Sales Only), PC A02/MF A01	DE82700086	MN -34A	7:32134
0022/ 80	NTIS (US Sales Only), PC A03/MF A01	DE82700087	MN -34A	7:32827
CBPF-NF-				
023/ 80	NTIS (US Sales Only), PC A02/MF A01	DE82700088	MN -34A	7:32178
029/ 80	NTIS (US Sales Only), PC A02/MF A01	DE82700089	MN -34A	7:32179
CEA-N-				
2213	NTIS (US Sales Only), PC A04/MF A01	DE81701000	MN -80	7:31977
CEND-				
395	*See* DOE/ET/34030-1	DE82006121	STD -78	7:32014
CNEN-DIN-				
01/ 80	NTIS (US Sales Only), PC A03/MF A01	DE82700266	MN -25	7:31978
CNEN-RT/ING-				
80-27	TIC	DE82902724	ND -32	7:32912
CONF-780956-	(Solar high-temperature industrial processes workshop, Atlanta, GA, USA, 26-29 Sep 1978)			
	See SERI-0637-4	DE82000718	MN -62	7:31872
CONF-7811197-	(Study meeting on fuel failure in Mihama Unit 1 nuclear power plant, Kumatori, Osaka, Japan, 29 Nov 1978)			
	See KURRI-TR-197	DE82780220	MN -78	7:31927
CONF-790273-	(Colloquium on underground working and tunnelling, Berlin, F.R. Germany, 8-9 Feb 1979)			
(Vol3)	NTIS (US Sales Only), PC A15/MF A01	DE82901007	MN -88	7:31731
CONF-790278-	(7. Bakurianian school on radiation physics of metals and alloys, Bakuriani, USSR, Feb 1979)			
	See INIS-SU-61	DE82780223	MN -34A	7:32152
CONF-7903161-	(2. research co-ordination meeting on analysis of the behaviour of advanced reactor pressure vessel steels under neutron irradiation, Vienna, Austria, 1-2 Mar 1979)			
	See IWGRRPC-79/4	DE82780038	MN -80	7:32153
CONF-7903162-	(Meeting on x-ray detectors, Oho, Ibaraki, Japan, 22-23 Mar 1979)			
	See KEK-79-34	DE82780219	MN -28	7:32352
CONF-7904182-	(International conference on the experimental investigation at the U-400 accelerator, Dubna, USSR, 18-20 Apr 1979)			
1	*See* RI-120	DE82700356	MN -28	7:32711
CONF-790526-	(4. international meeting on modern ceramic technologies, St Vincent, Italy, 28 May-1 Jun 1979)			
3	NTIS, PC A02/MF A01	DE82005102	MN -25	7:32068
CONF-7909240-	(Nagoya seminar on atomic processes in fusion plasmas, Nagoya, Japan, 5-7 Sep 1979)			
	See IPPJ-AM-13	DE82780208	MN -20	7:32702
CONF-7911167-	(1. Regional Meeting on Chemistry, Sao Carlos, SP, Brazil, 22-24 Nov 1979)			
(Absts.)	*See* INIS-mf-6737	DE82780039	MN -34A	7:32188
CONF-7911169-	(USSR-Japan joint seminar on plasma diagnostics, Nagoya, Japan, 13-17 Nov 1979)			
	See IPPJ-438	DE82780213	MN -20	7:32857
CONF-791243-	(Japanese Nuclear Data Committee nuclear data workshop, Tokai-mura Ibaraki-ken, Japan, 10-11 Dec 1979)			
	See JAERI-M-8769	DE82780217	MN -34C	7:32763
CONF-791275-	(Workshop on nuclear physics to be studied by NUMATRON accelerator, Tokyo, Japan, 7-9 Dec 1979)			
	See INS-NUMA-18	DE82780216	MN -34C	7:32762
CONF-800104-	(18. AIAA aerospace sciences meeting, Pasadena, CA, USA, 14-16 Jan 1980)			
	AIAA Pap., No. 80-0091, vp(1980)			7:32107
CONF-800155-	(6. Brazilian symposium on theoretical physics, Rio de Janeiro, Brazil, 7-18 Jan 1980)			
2	*See* IFUSP-P-206	DE82700193	MN -34C	7:32796
CONF-8003163-	(US/Japan workshop on divertors, first wall materials, and impurity control, Tokai, Ibaraki, Japan, 17-20 Mar 1980)			
	See JAERI-M-8971	DE82780209	MN -20	7:32894
CONF-8004194-	(Conference on trends in nuclear structure physics, Manchester, UK, 16-18 Apr 1980)			
1	*See* KFK-2974	DE82780285	MN -34C	7:32781
CONF-8005128-	(International conference on plasma science, Madison, WI, USA, 19-22 May 1980)			
2	*See* GKSS-80/E/33	DE82780281	MN -20	7:32328
CONF-8005190-	(Canadian Nuclear Association heat exchanger reliability seminar, Toronto, Canada, 1 May 1980)			
(Pt.2)	*See* INIS-mf-6612	DE82780020	MN -80	7:31938

Report No.	Availability	Order No.	Distribution Category	Abstract No.
CONF-800626-	(6. international conference on vacuum ultraviolet radiation physics, Charlottesville, VA, USA, 2-6 Jun 1980)			
9	*See* DOE/ER/02892-29	DE82007541	MN -34	7:32694
CONF-8006214-	(Summer Faculty Institute Center for Educational Affairs conference, Argonne, IL, USA, 16-20 Jun 1980)			
1	*See* PNL-SA-8604	DE82005911	MN -70	7:31801
CONF-8006225-	(American Society for Testing and Materials symposium on petroleum products and lubricants, Chicago, IL, USA, 24 Jun 1980)			
	American Society for Testing and Materials, 1916 Race St., Philadelphia, PA 19103			7:31755
	Am. Soc. Test. Mater., Spec. Tech. Publ., No. 751, 3-21(1981)			7:31756
	Am. Soc. Test. Mater., Spec. Tech. Publ., No. 751, 22-33(1981)			7:31757
	Am. Soc. Test. Mater., Spec. Tech. Publ., No. 751, 34-46(1981)			7:31758
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	Am. Soc. Test. Mater., Spec. Tech. Publ., No. 751, 92-102(1981)			7:31764
	Am. Soc. Test. Mater., Spec. Tech. Publ., No. 751, 145-156(1981)			7:31765
	Am. Soc. Test. Mater., Spec. Tech. Publ., No. 751, 76-83(1981)			7:31775
	Am. Soc. Test. Mater., Spec. Tech. Publ., No. 751, 84-91(1981)			7:31828
CONF-8007127-	(7. international congress on the chemistry of cement, Paris, France, Jul 1980)			
1	*See* DOE/CS/40222-2	DE82007359	MN -90i	7:31723
CONF-8009103-	(Symposium on environmental aspects of fuel conversion technology, St Louis, MO, USA, Sep 1980)			
2	*See* PNL-SA-8813	DE82005912	MN -90d	7:31747
CONF-8009134-	(3. international meeting on solid electrolytes, Tokyo, Japan, 15-19 Sep 1980)			
2	NTIS, PC A02/MF A01	DE82006837	MN -25	7:32069
CONF-8009198-	(5. national Soviet conference on neutron physics, Kiev, Ukrainian SSR, 15-19 Sep 1980)			
(Pt.1)	*See* INIS-SU-40	DE82780226	MN -34C	7:32811
CONF-801152-	(Electric Power Research Institute workshop, Atlanta, GA, USA, 17-19 Nov 1980)			
3	NTIS, PC A02/MF A01	DE82004085	MN -98A	7:32091
CONF-801209-	(2. annual National Waste Terminal Storage (NWTS) information meeting, Columbus, OH, USA, 9-11 Dec 1980)			
10	*See* PNL-SA-8927	DE82005872	MN -70	7:31802
CONF-810270-	(French-Greek colloquium on energy, Athens, Greece, 26-27 Feb 1981)			
6	*See* FRNC-CONF-206	DE82780032	MN -80	7:31915
CONF-810306-	(5. symposium on turbulence, diffusion, and air pollution, Atlanta, GA, USA, 9-13 Mar 1981)			
8	*See* PNL-SA-8705	DE82006088	MN -11	7:32475
CONF-810370-	(8. annual energy conservation management conference, Portland, OR, USA, 17-18 Mar 1981)			
	NTIS, PC A07/MF A01	DE82006898	MN -95	7:32089
CONF-810385-	(Conference on non-linear problems: present and future, Los Alamos, NM, USA, Mar 1981)			
5	*See* LA-UR-81-3590	DE82006106	MN -34D	7:32836
CONF-8103124-	(12. annual Appalachian petroleum geology symposium, Morgantown, WV, USA, 17-20 Mar 1981)			
Absts	Director, State Geologist, Mount Chateau, Mont Chateau Rd., P.O. Box 879, Morgantown, WV 26505, $6.00		MN -92	7:31749
CONF-810409-	(IAEA international symposium on methods of low-level counting and spectrometry, Berlin, F.R. Germany, 6-10 Apr 1981)			
5	*See* PNL-SA-8945	DE82005902	MN -4	7:32200
6	*See* PNL-SA-8992	DE82005903	MN -4	7:31817
CONF-810436-	(Environmetrics '81 conference, Washington, DC, USA, 6-8 Apr 1981)			
5	*See* PNL-SA-9014	DE82005883	MN -11	7:32498
CONF-8104135-	(American Chemical Society meeting, Atlanta, GA, USA, Apr 1981)			
1	*See* PNL-SA-9020	DE82006085	MN -4	7:31719
CONF-8104139-	(2. national conference on manufacture of high purity steel, Pizen, Czechoslovakia, 13-16 Apr 1981)			
	See INIS-mf-6793	DE82780195	MN -80	7:32150

Report No.	Availability	Order No.	Distribution Category	Abstract No.
CONF-810505-	(Institute of Environmental Sciences annual meeting, Los Angeles, CA, USA, 4-7 May 1981)			
6	*See* PNL-SA-9311	DE82005981	MN -11	7:32480
CONF-8105118-	(1. groundwater monitoring symposium, Columbus, OH, USA, 29 May 1981)			
2	*See* RHO-SA-216	DE82005749	MN -70	7:32534
CONF-810606-	(American Nuclear Society's annual meeting, Miami Beach, FL, USA, 7-12 Jun 1981)			
103	*See* PNL-SA-9133	DE82005884	MN -41	7:32572
104	*See* PNL-SA-9100	DE82006079	MN -78	7:31918
CONF-810625-	(ASME PVP conference, Denver, CO, USA, 21-26 Jun 1981)			
	HTD [Publ.] (Am. Soc. Mech. Eng.), 46: 1-18(1981)			7:31932
	HTD [Publ.] (Am. Soc. Mech. Eng.), 46: 105-118(1981)			7:31933
	New York, NY; ASME (1981).			7:32052
	HTD [Publ.] (Am. Soc. Mech. Eng.), 46: 19-30(1981)			7:32053
	HTD [Publ.] (Am. Soc. Mech. Eng.), 46: 31-45(1981)			7:32054
	HTD [Publ.] (Am. Soc. Mech. Eng.), 46: 71-88(1981)			7:32055
	HTD [Publ.] (Am. Soc. Mech. Eng.), 46: 89-103(1981)			7:32056
	HTD [Publ.] (Am. Soc. Mech. Eng.), 46: 119-130(1981)			7:32057
	HTD [Publ.] (Am. Soc. Mech. Eng.), 47: 71-94(1981)			7:32247
CONF-810650-	(International seminar on chemistry and process engineering for high-level waste solidification, Julich, F.R. Germany, 1-5 Jun 1981)			
3	*See* PNL-SA-9440	DE82005982	MN -70	7:31803
CONF-810684-	(APS conference on shock waves in condensed matter, Menlo Park, CA, USA, 23-25 Jun 1981)			
56	*See* UCRL-87038	DE82006931	MN -21	7:32904
CONF-8106109-	(Workshop on processing needs and methodology for wastewaters from the conversion of coal, oil shale and biomass to synfuels, Germantown, MD, USA, Jun 1981)			
4	*See* PNL-SA-9805	DE82005930	MN -91	7:31776
5	*See* PNL-SA-9806	DE82005904	MN -13	7:31730
CONF-8106152-	(American Association for the Advancement of Science annual meeting of the pacific division, Eugene, OR, USA, 15-18 Jun 1981)			
2	*See* PNL-SA-9630	DE82005905	MN -11	7:32470
CONF-8106189-	(9. US national congress of applied mechanics, Ithaca, NY, USA, 21-25 Jun 1981)			
1	*See* SAND-81-1729C	DE82006283	MN -38	7:32847
CONF-810746-	(International symposium on the fracture mechanics of ceramics, University Park, PA, USA, 15-17 Jul 1981)			
4	*See* DOE/ER/10856-1	DE82006247	MN -25	7:32170
CONF-810765-	(8. international symposium on controlled release of bioactive materials, Fort Lauderdale, FL, USA, 26-29 Jul 1981)			
2	*See* PNL-SA-9503	DE82006167	MN -70	7:31818
CONF-810770-	(Summer institute on particle physics, Stanford, CA, USA, 27 Jul-7 Aug 1981)			
2	*See* FERMILAB-Conf-81/80-Exp.	DE82004401	MN -34D	7:32724
CONF-810801-	(6. international conference on structural mechanics in reactor technology, Paris, France, 17-21 Aug 1981)			
59	NTIS, PC A02/MF A 01	DE82005951	MN -20	7:32879
CONF-810804-	(20. national heat transfer conference, Milwaukee, WI, USA, 2-5 Aug 1981)			
23	*See* PNL-SA-9441	DE82005979	MN -79e	7:31948
CONF-810812-	(IECEC conference, Atlanta, GA, USA, 9-14 Aug 1981)			
42	NTIS, PC A02/MF A01	DE82006272	MN -66	7:31893
CONF-810831-	(Fusion reactor materials meeting, Seattle, WA, USA, 9-12 Aug 1981)			
69	*See* DOE/ER/10107-6	DE82006757	MN -20c	7:32881
70	*See* DOE/ER/10107-5	DE82006758	MN -20c	7:32139
71	*See* DOE/ER/10107-8	DE82006755	MN -20c	7:32882
72	*See* DOE/ER/10107-9	DE82006754	MN -20c	7:32141
73	*See* DOE/ER/10107-10	DE82006753	MN -20c	7:32883
74	*See* DOE/ER/10107-11	DE82006752	MN -20c	7:32884
75	*See* DOE/ER/10107-12	DE82006751	MN -20c	7:32885
76	*See* DOE/ER/10107-7	DE82006756	MN -20c	7:32140
77	*See* DOE/ER/10107-4	DE82003871	MN -20c	7:32138
78	*See* DOE/ER/10107-3	DE82003870	MN -20c	7:32137
80	NTIS, PC A02/MF A01	DE82006269	MN -20c	7:32880
81	*See* PNL-SA-9759	DE82006882	MN -20c	7:32158
CONF-810842-	(American Statistical Association meeting, Detroit, MI, USA, 10-13 Aug 1981)			
3	NTIS, PC A02/MF A01	DE82005955	MN -32	7:32845
CONF-810865-	(Solar world forum, Brighton, UK, 23-28 Aug 1981)			
10	NTIS, PC A02/MF A01	DE82902128	MN -61a	7:31835
CONF-810897-	(17. biennial conference of the Institute of Briquetting and Agglomeration, Reno, NV, USA, 31 Aug-2 Sep 1981)			
2	*See* PNL-SA-9739	DE82005917	MN -70	7:31804
CONF-8108108-	(Conference on structural elements and statistical mechanics on field theory, Freiburg, F.R. Germany, 31 Aug-11 Sep 1981)			
1	*See* LA-UR-81-3636	DE82006154	MN -34D	7:32754

Report No.	Availability	Order No.	Distribution Category	Abstract No.
CONF-810948-	(Actinides-1981 conference, Pacific Grove, CA, USA, 10-15 Sep 1981)			
3	*See* UCRL-85944	DE82005701	MN -4	7:32237
CONF-810969-	(IAEA conference, Grenoble, France, 28 Sep-2 Oct 1981)			
2	*See* IAEA-CN-40/74P	DE82002729	MN -23	7:32234
CONF-810992-	(3. international conference on environmental mutagens, Tokyo, Japan, 20-28 Sep 1981)			
3	*See* BNL-30356	DE82005509	MN -48	7:32586
CONF-811012-	(IEEE symposium on nuclear science, San Francisco, CA, USA, 21-23 Oct 1981)			
47	*See* BNL-30337	DE82005236	MN -32	7:32327
48	*See* SLAC-PUB-2835	DE82005273	MN -32	7:32926
CONF-811013-	(Electrochemical Society conference, Denver, CO, USA, 11-16 Oct 1981)			
16	*See* SERI/TP-211-1494	DE82007001	MN -63b	7:31853
CONF-811066-	(International energy storage conference, Seattle, WA, USA, 19-21 Oct 1981)			
7	*See* PNL-SA-9891	DE82006026	MN -62	7:32067
CONF-811083-	(1981 linear accelerator conference, Santa Fe, NM, USA, 19-23 Oct 1981)			
17	*See* LA-UR-81-3058	DE82006128	MN -28	7:32326
20	*See* LA-UR-81-3057	DE82006126	MN -28	7:32325
CONF-811086-	(6. symposium on polycyclic aromatic hydrocarbons, Columbus, OH, USA, 27-29 Oct 1981)			
2	*See* LA-UR-81-3204	DE82002349	MN -48	7:32587
CONF-8110115-	(13. biomass thermochemical conversion contractors meeting, Washington, DC, USA, 27-29 Oct 1981)			
2	*See* PNL-SA-9975	DE82005224	MN -61a	7:31849
CONF-8110125-	(International symposium on the application of the dose limitation system in nuclear fuel cycle facilities and other radiation practices, Madrid, Spain, 22 Oct 1981)			
1	NTIS, PC A02/MF A01	DE82004208	MN -11	7:32505
CONF-8110141-	(Conference on large body impacts and terrestrial evolution, Snowbird, UT, USA, 18-22 Oct 1981)			
1	*See* LA-UR-81-3573	DE82006105	MN -11	7:32474
CONF-8110142-	(Instrument Society of America conference, Anaheim, CA, USA, 6-8 Oct 1981)			
1	*See* UCRL-86438	DE82006740	MN -38	7:32254
CONF-8110143-	(International conference on scientific results of the monsoon experiment, Denpasar, Bali, Indonesia, 26-30 Oct 1981)			
1	*See* BNL-30322	DE82005503	MN -11	7:32472
CONF-8110144-	(Symposium on aging brain and regot alkaloids, Rome, Italy, 28-30 Oct 1981)			
1	*See* BNL-30551	DE82005511	MN -48	7:32540
CONF-8110146-	(26. symposium on safety in ammonia plants and related facilities, Montreal, Canada, 4-9 Oct 1981)			
1	*See* PNL-SA-9057	DE82006163	MN -11	7:31831
CONF-811103-	(ANS winter meeting, San Francisco, CA, USA, 29 Nov-4 Dec 1981)			
68	NTIS, PC A02/MF A01	DE82004057	MN -78	7:31959
69	NTIS, PC A02/MF A01	DE82004056	MN -79d	7:31943
CONF-811108-	(Annual meeting of the Institute of Chemical Engineers, New Orleans, LA, USA, 8-12 Nov 1981)			
15	*See* EGG-M-04481	DE82006215	MN -61a	7:31841
CONF-811113-	(American Vacuum Society national symposium, Anaheim, CA, USA, 3-6 Nov 1981)			
48	*See* UCRL-86160	DE82006926	MN -21	7:31822
CONF-811130-	(3. annual DOE participants information meeting on low-level waste management, New Orleans, LA, USA, 4-6 Nov 1981)			
15	*See* PNL-SA-10022	DE82005781	MN -70	7:31792
16	*See* PNL-SA-10019	DE82005839	MN -70	7:31805
CONF-811168-	(Hewlett-Packard-1000 international users group conference, College Park, MD, USA, 30 Nov-2 Dec 1981)			
1	*See* UCRL-86341	DE82006795	MN -32	7:32928
CONF-811171-	(American Society of Agronomy meeting, Atlanta, GA, USA, 29 Nov-4 Dec 1981)			
1	*See* DP-MS-81-72	DE82004347	MN -69	7:32497
CONF-811172-	(9. midwest solid state theory symposium on melting, localization and chaos, Argonne, IL, USA, 2-3 Nov 1981)			
1	*See* BNL-30432	DE82005502	MN -34D	7:32752
CONF-811173-	(Workshop on surface subsidence due to underground mining, Morgantown, WV, USA, 30 Nov-2 Dec 1981)			
1	*See* LA-UR-81-3700	DE82006136	MN -11	7:32594
CONF-811174-	(2. convention of the international colloquium on drops and bubbles, Monterey, CA, USA, 19-21 Nov 1981)			
2	*See* UCRL-86964	DE82005869	MN -34C	7:32606
CONF-811212-	(4. international conference on alternative energy sources, Miami Beach, FL, USA, 14-16 Dec 1981)			
2	*See* LA-UR-81-3071	DE82002371	MN -96	7:32130
10	*See* BNL-30440	DE82006933	MN -92	7:31771
11	*See* PNL-SA-9982	DE82005804	MN -61a	7:31850
12	*See* BNL-30441	DE82006932	MN -59c	7:31866

Report No.	Availability	Order No.	Distribution Category	Abstract No.
CONF-811214-	(1981 fall DECUS symposium, Los Angeles, CA, USA, 7-11 Dec 1981)			
4	*See* UCRL-86500	DE82006742	MN -32	7:32929
5	*See* PNL-SA-9984	DE82005934	MN -32	7:32921
6	NTIS, PC A02/MF A01	DE82005193	MN -32	7:32913
CONF-811219-	(1. Latin American conference on applied mathematics, Santiago, Chile, 14-16 Dec 1981)			
1	*See* SAND-82-0061C	DE82006295	MN -32	7:32925
CONF-820107-	(SPIE optical coatings for energy efficiency and solar applications conference, Los Angeles, CA, USA, 25-29 Jan 1982)			
2	*See* UCRL-87037	DE82005698	MN -21	7:32903
3	*See* LA-UR-81-3610	DE82006104	MN -66e	7:31879
4	*See* SAND-82-0025C	DE82006299	MN -38	7:32185
CONF-820112-	(Semiannual meeting of the American Society of Heating, Refrigerating, and Air Conditioning Engineers, Houston, TX, USA, 24-28 Jan 1982)			
1	*See* SERI/TP-254-1482	DE82006117	MN -59c	7:32116
CONF-820204-	(COMPCON '82 meeting, San Francisco, CA, USA, Feb 1982)			
1	*See* LA-UR-81-3558	DE82006108	MN -32	7:32919
CONF-820217-	(9. energy technology conference, Washington, DC, USA, 16-18 Feb 1982)			
4	Institute of Gas Technology, 3424 South State Street, IIT Center, Chicago, IL 60616		MN -61a	7:31836
5	Inst. of Gas Technology, 3424 S. State Street, IIT Center, Chicago, IL 60616		MN -91	7:31773
CONF-820301-	(2. American Electroplater's Society symposium on plating on difficult to plate metals, St Louis, MO, USA, Mar 1982)			
2	*See* Y/DW-282	DE82007334	MN -25	7:32161
COO-				
2383-0081	*See* UIUCDCS-R-81-1072	DE82005330	MN -32	7:32304
2826-15	*See* PNE-81-150	DE82004896	MN -79e	7:32008
2892-30	*See* DOE/ER/02892-30	DE82006896	MN -34A	7:32695
CRWR-				
180	Center for Research in Water Resources, 10100 Burnet Road, Austin, TX 78758,, $8.75		MN -51	7:31783
CTA-EAV-				
007/ 79	NTIS (US Sales Only), PC A03/MF A01	DE81700994	MN -80	7:31960
024/ 79	NTIS (US Sales Only), PC A03/MF A01	DE82700361	MN -80	7:31961
CTA-EAV-NT-				
011/ 79	NTIS (US Sales Only), PC A03/MF A01	DE81700996	MN -80	7:31962
DFE-				
35	NTIS (US Sales Only), PC A03/MF A01	DE82900992	MN -61a	7:31837
DFVLR-FB-				
79-32	NTIS (US Sales Only), PC A06/MF A01	DE82780277	MN -25	7:32169
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DOE/BC/10003-				
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DOE/CS/20295-				
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T20	NTIS, PC A11/MF A01	DE82005412	MN -96	7:32128
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30	NTIS, PC A03/MF A01	DE82006896	MN -34A	7:32695
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T1	NTIS, PC A03/MF A01	DE82004631	MN -34C	7:32787
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5	NTIS, PC A02/MF A01	DE82006911	MN -4	7:32246
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137	NTIS, PC A03/MF A01	DE82006799	MN -4	7:32230
DOE/ER/04699-				
7	NTIS, PC A07/MF A01	DE82006838	MN -34C	7:32604
DOE/ER/04861-				
3	NTIS, PC A02/MF A01	DE82004897	MN -25	7:32136
DOE/ER/04949-				
1	NTIS, PC A05/MF A01	DE82007524	MN -4	7:32215

Report No.	Availability	Order No.	Distribution Category	Abstract No.
DOE/ER/04996-2	NTIS, PC A03/MF A01	DE82007518	MN -63e	7:31877
DOE/ER/05224-5	NTIS, PC A03/MF A01	DE82006839	MN -34C	7:32761
DOE/ER/10107-3	NTIS, PC A02/MF A01	DE82003870	MN -20c	7:32137
4	NTIS, PC A02/MF A01	DE82003871	MN -20c	7:32138
5	NTIS, PC A02/MF A01	DE82006758	MN -20c	7:32139
6	NTIS, PC A02/MF A01	DE82006757	MN -20c	7:32881
7	NTIS, PC A02/MF A01	DE82006756	MN -20c	7:32140
8	NTIS, PC A02/MF A01	DE82006755	MN -20c	7:32882
9	NTIS, PC A02/MF A01	DE82006754	MN -20c	7:32141
10	NTIS, PC A02/MF A01	DE82006753	MN -20c	7:32883
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12	NTIS, PC A02/MF A01	DE82006751	MN -20c	7:32885
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DOE/ER/10389-2	NTIS, PC A05/MF A01	DE82006304	MN -25	7:32142
DOE/ER/10516-10	NTIS, PC A02/MF A01	DE82006903	MN -34C	7:32723
DOE/ER/10556-86	NTIS, PC A04/MF A01	DE82007522	MN -25	7:32143
DOE/ER/10575-2	NTIS, PC A02/MF A01	DE82004885	MN -59c	7:31878
DOE/ER/10727-T1	NTIS, PC A03/MF A01	DE82005334	MN -80	7:31998
DOE/ER/10856-1	NTIS, PC A02/MF A01	DE82006247	MN -25	7:32170
DOE/ER/10890-1	NTIS, PC A02/MF A01	DE82005631	MN -34	7:32829
DOE/ER/40033-13	NTIS, PC A02/MF A01	DE82005518	MN -34D	7:32369
DOE/ER/40039-1	NTIS, PC A02/MF A01	DE82006798	MN -34D	7:32358
DOE/ET/12074-T1	NTIS, PC A05/MF A01	DE82004536	MN -91	7:31769
T3	NTIS, PC A03/MF A01	DE82002297	MN -91	7:31770
DOE/ET/13354-T1	NTIS, PC A06/MF A01	DE82005246	STD -88	7:31732
DOE/ET/14746-1	NTIS, PC A05/MF A01	DE82006826	STD -90i	7:31746
DOE/ET/20091-1	NTIS, PC A03/MF A01	DE82007530	MN -13	7:32104
DOE/ET/20279-153	NTIS, PC A03/MF A01	DE82007040	STD -63	7:31855
DOE/ET/20356-5	NTIS, PC A06/MF A01	DE82005808	MN -63b	7:31856
DOE/ET/20618-T1	NTIS, PC A06/MF A01	DE82004905	MN -95f	7:32122
DOE/ET/21002-T21	NTIS, PC A05/MF A01	DE82005489	MN -64	7:31865
DOE/ET/29310-1	NTIS, PC A05/MF A01	DE82007468	MN -63d	7:31857
DOE/ET/34030-1	NTIS (US Sales Only), PC A03/MF A01	DE82006121	STD -78	7:32014
DOE/ET/51013-27	NTIS, PC A18/MF A01	DE82004871	STD -20	7:32848
DOE/ET/52008-2	NTIS, PC A02/MF A01	DE82007529	MN -20c	7:32886
DOE/ET/52018-16	NTIS, PC A02/MF A01	DE82006893	MN -25	7:32887
DOE/ET/53025-T10	NTIS, PC A03/MF A01	DE82002137	MN -20g	7:32696
DOE/EV/00936-T3	NTIS, PC A09/MF A01	DE82007332	MN -11	7:32603
DOE/EV/03759-T1	NTIS, PC A13/MF A01	DE82002999	MN -70	7:31816
DOE/EV/04500-2	NTIS, PC A02/MF A01	DE82005469	MN -34	7:32697
DOE/EV/04962-3	NTIS, PC A02/MF A01	DE82007506	MN -48	7:32541
DOE/EV/10025-T1	NTIS, PC A14/MF A01	DE82006190	MN -11	7:32080
DOE/EV/10380-2	NTIS, PC A04/MF A01	DE82006895	MN -48	7:32231
DOE/EV/10610-01	NTIS, PC A03/MF A01	DE82005484	MN -11	7:32473
DOE/FE/00080-2	NTIS, PC A05/MF A01	DE82005090	STD -88	7:31733
DOE/ID/12200-T1	NTIS, PC A06/MF A01	DE82006226	STD -97e	7:31832
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Report No.	Availability	Order No.	Distribution Category	Abstract No.
DOE/JPL-1012-61	NTIS, PC A03/MF A01	DE82005812	MN -63b	7:31838
DOE/MA-0047	NTIS, PC A06/MF A01	DE82006099	STD -13	7:32910
DOE/MC/14036-T1	NTIS, PC A07/MF A01	DE82006267	STD -90e	7:32305
DOE/NASA/0124-6	NTIS, PC A12/MF A01	DE82010113	STD -96	7:32131
DOE/NASA/10769-21	NTIS, PC A02/MF A01	DE82007562	STD -90g	7:32109
DOE/NASA/20320-34	NTIS, PC A02/MF A01	DE82007020	STD -60	7:31898
DOE/NRS-82/1	NTIS, PC A02/MF A01	DE82006750	STD -80	7:32015
DOE/PC/30216-T3	NTIS, PC A02/MF A01	DE82006294	MN -90e	7:31740
DOE/PC/30222-T2	NTIS, PC A03/MF A01	DE82004941	MN -90a	7:31724
DOE/PC/30230-23	NTIS, PC A02/MF A01	DE82007006	MN -90d	7:31725
DOE/PC/40270-3	NTIS, PC A03/MF A01	DE82007012	MN -90i	7:31741
DOE/PC/40778-T1	NTIS, PC A03/MF A01	DE82005208	MN -90d	7:31716
DOE/PC/40793-T1	NTIS, PC A04/MF A01	DE82006195	MN -90a	7:31726
DOE/PC/40797-1	NTIS, PC A02/MF A01	DE82005438	MN -90d	7:31717
DOE/PETC/TR-82/5	NTIS, PC A03/MF A01	DE82007670	STD -90d	7:31742
DOE/R5/10222-1	NTIS, PC A02/MF A01	DE82006912	MN -61a	7:31839
DOE/R5/10301-1	NTIS, PC A02/MF A01	DE82006209	MN -60	7:31899
DOE/RA/50076-T12	NTIS, PC A04/MF A01	DE82006759	MN -66	7:31881
DOE/SF/10763-T13	NTIS, PC A02/MF A01	DE82005369	MN -62d	7:31861
DOE/SF/10838-T1	NTIS, PC A07/MF A01	DE82002252	MN -66e	7:31895
DOE/SF/11436-1-Exect.Summ.	NTIS, PC A04/MF A01	DE82005296	STD -62	7:31862
DOE/TIC-3387	NTIS, PC A04/MF A01	DE82004645	STD -70	7:31793
7000-R5(App.)	NTIS, PC A11/MF A01	DE82005770	MN -2	7:32933
2005250	NTIS, PC A09/MF A01	DE82005250	MN -70	7:31794
2006853	NTIS, PC A02/MF A01	DE82006853	MN -90b	7:31739
2006904	NTIS, PC A05/MF A01	DE82006904	STD -61a	7:31840
2007065	NTIS, PC A05/MF A01	DE82007065	MN -13	7:32083
DOE-tr-248	NTIS, PC A02/MF A01	DE82002537	MN -88	7:31738
249	NTIS, PC A02/MF A01	DE82002544	MN -88	7:31737
DP-MS-81-72	NTIS, PC A02/MF A01	DE82004347	MN -69	7:32497
DTH-LV-MEDD-106	NTIS (US Sales Only), PC A10/MF A01	DE82900603	MN -59	7:31867
EFI-398(5) -80	NTIS (US Sales Only), PC A02/MF A01	DE82700408	MN -37	7:32370
401(8) -80	NTIS (US Sales Only), PC A02/MF A01	DE82700462	MN -32	7:32371
421(28) -80	NTIS (US Sales Only), PC A02/MF A01	DE82700188	MN -34C	7:32805
431(38) -80	NTIS (US Sales Only), PC A02/MF A01	DE82700189	MN -34C	7:32806
442(49) -80	NTIS (US Sales Only), PC A02/MF A01	DE82700103	MN -20	7:32849
EGG-M-02381	NTIS, PC A02/MF A01	DE82005645	MN -80	7:32016
04481	NTIS, PC A03/MF A01	DE82006215	MN -61a	7:31841
EMD-2-68-3319	*See* NP-2902698		MN -51	7:31784
EPA-600/7-81-087	*See* LA-8826-PR	DE82010983	STD -90i	7:31728
EPRI-EA-235-Vol.3	NTIS, PC A12/MF A01	DE82902007	MN -95c	7:32092
2153-Vol.1	NTIS, PC A11/MF A01	DE82902213	MN -98	7:32098
EPRI-EM-2193-Vol.3	NTIS, PC A15/MF A01	DE82007247	MN -97c	7:32099
EPRI-FP-671-Vol.3	NTIS, PC A12/MF A01	DE82901830	MN -90d	7:31727
EPRI-NP-526-Vol.4,Pt.2	NTIS, PC A99/MF A01	DE82005498	MN -78	7:32017
ERC-TR-8125	*See* DOE/NASA/0124-6	DE82010113	STD -96	7:32131
ERGONOMRAAD-R-18	NTIS (US Sales Only), PC A03/MF A01	DE81701003	MN -80	7:31954
EUR-7008	NTIS (US Sales Only), PC A04/MF A01	DE81700896	MN -80	7:31944
7050e	*See* KFK-3088	DE82780278	MN -25	7:32174

Report No.	Availability	Order No.	Distribution Category	Abstract No.
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2762-8	*See* DOE/MC/14036-T1	DE82006267	STD -90e	7:32305
FEI-				
1019	NTIS (US Sales Only), PC A02/MF A01	DE82700362	MN -80	7:31979
1022	NTIS (US Sales Only), PC A02/MF A01	DE82700463	MN -32	7:31999
1046	NTIS (US Sales Only), PC A02/MF A01	DE82700267	MN -25	7:32144
1061	NTIS (US Sales Only), PC A02/MF A01	DE82700439	MN -37	7:31945
1069	NTIS (US Sales Only), PC A02/MF A01	DE82700405	MN -80	7:32000
1079	NTIS (US Sales Only), PC A02/MF A01	DE82700363	MN -80	7:31963
1089	NTIS (US Sales Only), PC A03/MF A01	DE82700377	MN -80	7:31936
1094	NTIS (US Sales Only), PC A02/MF A01	DE82700248	MN -4	7:32232
1095	NTIS (US Sales Only), PC A02/MF A01	DE82700324	MN -38	7:31991
1097	NTIS (US Sales Only), PC A02/MF A01	DE82700364	MN -80	7:31964
1099	NTIS (US Sales Only), PC A02/MF A01	DE82700409	MN -37	7:32372
1100	NTIS (US Sales Only), PC A02/MF A01	DE82700365	MN -80	7:31980
1104	NTIS (US Sales Only), PC A02/MF A01	DE82700374	MN -80	7:31981
1109	NTIS (US Sales Only), PC A02/MF A01	DE82700090	MN -34A	7:32171
1110	NTIS (US Sales Only), PC A02/MF A01	DE82700366	MN -80	7:31965
1112	NTIS (US Sales Only), PC A03/MF A01	DE82700410	MN -37	7:32373
1113	NTIS (US Sales Only), PC A02/MF A01	DE82700268	MN -25	7:32145
1126	NTIS (US Sales Only), PC A02/MF A01	DE82700367	MN -80	7:31914
1128	NTIS (US Sales Only), PC A02/MF A01	DE82700329	MN -38	7:31982
1130	NTIS (US Sales Only), PC A02/MF A01	DE82700091	MN -34A	7:32807
1138	NTIS (US Sales Only), PC A02/MF A01	DE82700368	MN -80	7:31966
1145	NTIS (US Sales Only), PC A02/MF A01	DE82700269	MN -25	7:32146
1149	NTIS (US Sales Only), PC A02/MF A01	DE82700270	MN -25	7:32147
FERC-				
0069	NTIS, PC A04/MF A01	DE82007634	MN -98F	7:31744
FERMILAB-Conf-				
81/ 80-Exp.	NTIS, PC A02/MF A01	DE82004401	MN -34D	7:32724
FMA-BM-				
8148-81	Foster-Miller Associates, Inc., 350 Second Ave., Waltham, MA 02154		MN -88	7:31734
FRNC-CONF-				
206	NTIS (US Sales Only) PC A02/MF A01	DE82780032	MN -80	7:31915
GA-A-				
16467	NTIS, PC A05/MF A01	DE82007497	STD -77	7:32018
16558	NTIS, PC A02/MF A01	DE82005765	MN -77	7:31937
GJBX-				
1-82	NTIS, PC A13/MF A01	DE82007141	MN -51	7:31777
182-Vol.2B(Midnite)	NTIS, PC E99/MF, $7.40	DE82010011	MN -51	7:31778
182-Vol.2B(Mt.Leona)	NTIS, PC A99/MF A01	DE82007143	MN -51	7:31782
GKSS-				
80/ E/ 33	NTIS (US Sales Only), PC A02/MF A01	DE82780281	MN -20	7:32328
80/ E/ 36	NTIS (US Sales Only), PC A02/MF A01	DE82780282	MN -37	7:32374
GTR-NE-				
68	*See* PB-81-245011		MN -88	7:31729
HMI-B-				
332	NTIS, PC A10/MF A01	DE82780183	MN -80	7:31967
IAE-				
3144	NTIS (US Sales Only), PC A03/MF A01	DE81700787	MN -41	7:32537
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3268/ 7	NTIS (US Sales Only), PC A02/MF A01	DE82700104	MN -20	7:32852
3275/ 5	NTIS (US Sales Only), PC A02/MF A01	DE82700464	MN -32	7:31992
3280/ 5	NTIS (US Sales Only), PC A03/MF A01	DE82700369	MN -80	7:31968
3281/ 2	NTIS (US Sales Only), PC A03/MF A01	DE82700411	MN -37	7:32389
3288/ 5	NTIS (US Sales Only), PC A11/MF A01	DE82700370	MN -80	7:31946
3303/ 13	NTIS (US Sales Only), PC A03/MF A01	DE82700255	MN -4	7:32191
3308/ 9	NTIS (US Sales Only), PC A02/MF A01	DE82700093	MN -34A	7:32833
3309/ 6	NTIS (US Sales Only), PC A03/MF A01	DE82700105	MN -20	7:32853
3313/ 1	NTIS (US Sales Only), PC A02/MF A01	DE82700192	MN -34C	7:32772
3321/ 8	NTIS (US Sales Only), PC A03/MF A01	DE82700106	MN -20	7:32854
3324/ 7	NTIS (US Sales Only), PC A03/MF A01	DE82700107	MN -20	7:32855
3338/ 10	NTIS (US Sales Only), PC A02/MF A01	DE82700140	MN -34A	7:32149
3363/ 7	NTIS (US Sales Only), PC A03/MF A01	DE82700440	MN -37	7:32765
3377/ 5	NTIS (US Sales Only), PC A03/MF A01	DE82700371	MN -80	7:31969
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IAEA-R-				
2051-F	NTIS (US Sales Only), PC A02/MF A01	DE81701011	MN -37	7:32390
IAEA-SM-				
252/ 18	*See* PNL-SA-8992	DE82005903	MN -4	7:31817
252/ 25	*See* PNL-SA-8945	DE82005902	MN -4	7:32200
IDO-				
10086(80)	*See* DOE/TIC-2005250	DE82005250	MN -70	7:31794
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148	NTIS (US Sales Only), PC A05/MF A01	DE81700997	MN -80	7:31993
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206	NTIS (US Sales Only), PC A02/MF A01	DE82700193	MN -34C	7:32796
225	NTIS (US Sales Only), PC A02/MF A01	DE82700194	MN -34C	7:32773
239	NTIS (US Sales Only), PC A04/MF A01	DE82700094	MN -34A	7:32834
240	NTIS (US Sales Only), PC A02/MF A01	DE82700195	MN -34C	7:32797
241	NTIS (US Sales Only), PC A03/MF A01	DE82700196	MN -34C	7:32804
244	NTIS (US Sales Only), PC A02/MF A01	DE82700197	MN -34C	7:32768

Report No.	Availability	Order No.	Distribution Category	Abstract No.
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249	NTIS (US Sales Only), PC A02/MF A01	DE82700200	MN -34C	7:32769
250	NTIS (US Sales Only), PC A03/MF A01	DE82700201	MN -34C	7:32391
270	NTIS (US Sales Only), PC A02/MF A01	DE82700108	MN -20	7:32888
IFVE-OEF-				
80-141	NTIS (US Sales Only), PC A02/MF A01	DE82700412	MN -37	7:32392
81-45	NTIS (US Sales Only), PC A02/MF A01	DE82700413	MN -37	7:32393
81-63	NTIS (US Sales Only), PC A02/MF A01	DE82700414	MN -37	7:32394
IFVE-OEIPK-				
80-143	NTIS (US Sales Only), PC A02/MF A01	DE82700415	MN -37	7:32395
IFVE-ONF-				
81-5	NTIS (US Sales Only), PC A02/MF A01	DE82700465	MN -32	7:32448
81-24	NTIS (US Sales Only), PC A02/MF A01	DE82700416	MN -37	7:32396
IFVE-OP-				
81-17	NTIS (US Sales Only), PC A02/MF A01	DE82700095	MN -34A	7:32810
IG-				
114	NTIS, PC A03/MF A01	DE82004554	MN -59	7:31868
IIASA-ER-				
6	Office of Communications, IIASA, A-2361, Laxenburg, Austria			7:32051
IIASA-RR-				
81-31	National Technical Information Service, Springfield, VA 22161			7:32074
IIASA-WP-				
80-126	NTIS (US Sales Only), PC A05/MF A01	DE82901419	MN -98	7:32110
INDC(JAP)-				
61/ G	*See* JAERI-M-9714	DE82901989	MN -34C	7:32776
67/ L	*See* NEANDC(J)-80/U		ND -34C	7:32770
INIS-mf-				
6612	NTIS (US Sales Only), PC A09/MF A01	DE82780020	MN -80	7:31938
6726	NTIS (US Sales Only), PC A05/MF A01	DE82780038	MN -34A	7:32183
6729	NTIS (US Sales Only), PC A05/MF A01	DE82780059	MN -80	7:32250
6737	NTIS (US Sales Only), PC A06/MF A01	DE82780039	MN -34A	7:32188
6752	NTIS (US Sales Only), PC A02/MF A01	DE82780248	MN -37	7:31779
6753	NTIS (US Sales Only), PC A10/MF A01	DE82780202	MN -78	7:31920
6765	NTIS (US Sales Only), PC A04/MF A01	DE82780242	MN -38	7:32251
6766	NTIS (US Sales Only), PC A05/MF A01	DE82780240	MN -38	7:32111
6769	NTIS (US Sales Only), PC A10/MF A01	DE82780224	MN -20	7:32889
6770	NTIS (US Sales Only), PC A08/MF A01	DE82780243	MN -80	7:31983
6777	NTIS (US Sales Only), PC A06/MF A01	DE82700238	MN -4	7:31780
6793	NTIS (US Sales Only), PC A04/MF A01	DE82780195	MN -80	7:32150
6798	NTIS (US Sales Only), PC A05/MF A01	DE82780192	MN -34C	7:32798
6825	NTIS (US Sales Only), PC A04/MF A01	DE82780193	MN -34C	7:32789
6830	NTIS (US Sales Only), PC A05/MF A01	DE82780187	MN -34A	7:32151
6831	NTIS (US Sales Only), PC A08/MF A01	DE82780194	MN -4	7:32192
6833	NTIS (US Sales Only), PC A07/MF A01	DE82780204	MN -37	7:32397
6840	NTIS (US Sales Only), PC A03/MF A01	DE82780203	MN -78	7:31935
INIS-SU-				
33	NTIS (US Sales Only), PC A05/MF A01	DE82700109	MN -20	7:32890
39	NTIS, PC A07/MF A01	DE82780229	MN -34C	7:32822
40	NTIS, PC A15/MF A01	DE82780226	MN -34C	7:32811
60	NTIS (US Sales Only), PC A02/MF A01	DE82700417	MN -37	7:32398
61	NTIS, PC A07/MF A01	DE82780223	MN -34A	7:32152
67	NTIS, PC A06/MF A01	DE82780241	MN -28	7:32314
INR-				
1746/ 17/ C/ A	NTIS (US Sales Only), PC A02/MF A01	DE81700959	MN -4	7:32223
INS-				
393	NTIS (US Sales Only), PC A02/MF A01	DE82700202	MN -34C	7:32739
398	NTIS (US Sales Only), PC A03/MF A01	DE82700218	MN -34C	7:32775
INS-NUMA-				
18	NTIS (US Sales Only), PC A07/MF A01	DE82780216	MN -34C	7:32762
IPEN-Pub-				
17	NTIS (US Sales Only), PC A02/MF A01	DE82700239	MN -4	7:32193
IPP-				
4/ 188	NTIS (US Sales Only), PC A02/MF A01	DE82780272	MN -20	7:31821
6-201	NTIS (US Sales Only), PC A02/MF A01	DE82780289	MN -20	7:32856
IPPJ-				
438	NTIS (US Sales Only), PC A11/MF A01	DE82780213	MN -20	7:32857
472	NTIS (US Sales Only), PC A02/MF A01	DE82700110	MN -20	7:32891
473	NTIS (US Sales Only), PC A02/MF A01	DE82700111	MN -20	7:32892
474	NTIS (US Sales Only), PC A02/MF A01	DE82700112	MN -20	7:32858
475	NTIS (US Sales Only), PC A02/MF A01	DE82700113	MN -20	7:32859
476	NTIS (US Sales Only), PC A02/MF A01	DE82700114	MN -20	7:32860
477	NTIS (US Sales Only), PC A03/MF A01	DE82700115	MN -20	7:32861
478	NTIS (US Sales Only), PC A02/MF A01	DE82700116	MN -20	7:32862
480	NTIS (US Sales Only), PC A02/MF A01	DE82700117	MN -20	7:32863
481	NTIS (US Sales Only), PC A02/MF A01	DE82700118	MN -20	7:32864
483	NTIS (US Sales Only), PC A03/MF A01	DE82700119	MN -20	7:32865
484	NTIS (US Sales Only), PC A03/MF A01	DE82700120	MN -20	7:32866
485	NTIS (US Sales Only), PC A02/MF A01	DE82700121	MN -20	7:32867
486	NTIS (US Sales Only), PC A03/MF A01	DE82700122	MN -20	7:32868
487	NTIS (US Sales Only), PC A03/MF A01	DE82700123	MN -20	7:32869
IPPJ-AM-				
13	NTIS (US Sales Only), PC A05/MF A01	DE82780208	MN -20	7:32702

Report No.	Availability	Order No.	Distribution Category	Abstract No.
15	NTIS (US Sales Only), PC A09/MF A01	DE82700078	MN -34A	7:32703
IPPJ-DT-				
82	NTIS (US Sales Only), PC A02/MF A01	DE82700124	MN -20	7:32870
ITEF-				
12(1981)	NTIS (US Sales Only), PC A02/MF A01	DE82700125	MN -20	7:32893
112(1980)	NTIS (US Sales Only), PC A02/MF A01	DE82700441	MN -37	7:32449
122(1980)	NTIS (US Sales Only), PC A03/MF A01	DE82700378	MN -80	7:31921
159(1980)	NTIS (US Sales Only), PC A02/MF A01	DE82700418	MN -37	7:32399
162(1980)	NTIS (US Sales Only), PC A02/MF A01	DE82700466	MN -32	7:31970
164(1980)	NTIS (US Sales Only), PC A02/MF A01	DE82700467	MN -32	7:31971
168(1980)	NTIS (US Sales Only), PC A03/MF A01	DE82700468	MN -32	7:32400
176(1980)	NTIS (US Sales Only), PC A02/MF A01	DE82700469	MN -32	7:32401
ITEP-				
13(1981)	NTIS (US Sales Only), PC A04/MF A01	DE82700203	MN -34C	7:32799
ITP-				
80-108-E	NTIS (US Sales Only), PC A03/MF A01	DE82700126	MN -20	7:32871
IWGRRPC-				
79/ 4	NTIS (US Sales Only), PC A09/MF A01	DE82780038	MN -80	7:32153
JAERI-M-				
8769	NTIS (US Sales Only), PC A13/MF A01	DE82780217	MN -34C	7:32763
8971	NTIS (US Sales Only), PC A16/MF A01	DE82780209	MN -20	7:32894
9159	NTIS (US Sales Only), PC A02/MF A01	DE82700249	MN -4	7:32194
9167	NTIS (US Sales Only), PC A06/MF A01	DE82700470	MN -32	7:32872
9213	NTIS (US Sales Only), PC A02/MF A01	DE82700127	MN -20	7:32895
9235	NTIS (US Sales Only), PC A04/MF A01	DE82700473	MN -32	7:31972
9242	NTIS (US Sales Only), PC A03/MF A01	DE82700128	MN -20	7:32896
9310	NTIS (US Sales Only), PC A04/MF A01	DE82700079	MN -34A	7:32704
9336	NTIS (US Sales Only), PC A18/MF A01	DE82700259	MN -4	7:32216
9354	NTIS (US Sales Only), PC A05/MF A01	DE82700129	MN -20	7:32873
9359	NTIS (US Sales Only), PC A03/MF A01	DE82700474	MN -80	7:32029
9403	NTIS (US Sales Only), PC A07/MF A01	DE82700382	MN -78	7:32030
9404	NTIS (US Sales Only), PC A06/MF A01	DE82700383	MN -78	7:32031
9714	NTIS (US Sales Only), PC A07/MF A01	DE82901989	MN -34C	7:32776
9981	*See* NEANDC(J)-80/U		ND -34C	7:32770
JEN-				
500	NTIS (US Sales Only), PC A03/MF A01	DE81701002	MN -80	7:31984
JHU-HET-				
8108	*See* DOE/ER/03285-40	DE82006959	MN -34D	7:32722
8109	*See* DOE/ER/03285-41	DE82006825	MN -34D	7:32738
JILA-				
117	Univ. of Colorado, Boulder, CO		MN -34B	7:32605
JINR-				
1-81-29	NTIS (US Sales Only), PC A02/MF A01	DE82700442	MN -37	7:32450
1-81-82	NTIS (US Sales Only), PC A02/MF A01	DE82700222	MN -34C	7:32725
6-81-75	NTIS (US Sales Only), PC A02/MF A01	DE82700250	MN -4	7:32195
8-80-536	NTIS (US Sales Only), PC A02/MF A01	DE82700141	MN -34A	7:32719
9-81-304	NTIS (US Sales Only), PC A02/MF A01	DE82700478	MN -32	7:32914
10-80-831	NTIS (US Sales Only), PC A02/MF A01	DE82700419	MN -37	7:32402
10-81-159	NTIS (US Sales Only), PC A02/MF A01	DE82700477	MN -32	7:32403
11-81-300	NTIS (US Sales Only), PC A02/MF A01	DE82700420	MN -37	7:32404
13-80-808	NTIS (US Sales Only), PC A02/MF A01	DE82700422	MN -37	7:32405
13-81-11	NTIS (US Sales Only), PC A02/MF A01	DE82700444	MN -37	7:32451
18-80-540	NTIS (US Sales Only), PC A02/MF A01	DE82700204	MN -34C	7:32766
18-80-841	NTIS (US Sales Only), PC A02/MF A01	DE82700240	MN -4	7:32196
E-1-80-799	NTIS (US Sales Only), PC A02/MF A01	DE82700205	MN -34C	7:32777
E-1-81-154	NTIS (US Sales Only), PC A02/MF A01	DE82700206	MN -34C	7:32778
E-7-12219	NTIS (US Sales Only), PC A02/MF A01	DE82700080	MN -34A	7:32705
E-10-80-787	NTIS (US Sales Only), PC A02/MF A01	DE82700479	MN -32	7:32406
E-11-80-782	NTIS (US Sales Only), PC A02/MF A01	DE82700460	MN -32	7:32915
E-17-81-60	NTIS (US Sales Only), PC A02/MF A01	DE82700096	MN -34A	7:32812
JINR-R-				
1-81-30	NTIS (US Sales Only), PC A02/MF A01	DE82700423	MN -37	7:32407
2-80-774	NTIS (US Sales Only), PC A02/MF A01	DE82700212	MN -34C	7:32800
3-80-779	NTIS (US Sales Only), PC A02/MF A01	DE82700227	MN -34C	7:32779
3-81-19	NTIS (US Sales Only), PC A02/MF A01	DE82700228	MN -34C	7:32783
4-81-72	NTIS (US Sales Only), PC A02/MF A01	DE82700081	MN -34A	7:32706
4-81-148	NTIS (US Sales Only), PC A02/MF A01	DE82700214	MN -34C	7:32784
4-81-243	NTIS (US Sales Only), PC A02/MF A01	DE82700215	MN -34C	7:32785
6-81-23	NTIS (US Sales Only), PC A02/MF A01	DE82700229	MN -34C	7:32780
7-12054	NTIS (US Sales Only), PC A02/MF A01	DE82700230	MN -34C	7:32792
7-12056	NTIS (US Sales Only), PC A02/MF A01	DE82700231	MN -34C	7:32793
7-12061	NTIS (US Sales Only), PC A02/MF A01	DE82700232	MN -34C	7:32790
10-80-826	NTIS (US Sales Only), PC A02/MF A01	DE82700424	MN -37	7:32001
10-80-861	NTIS (US Sales Only), PC A02/MF A01	DE82700480	MN -32	7:31973
10-81-56	NTIS (US Sales Only), PC A02/MF A01	DE82700484	MN -32	7:32408
10-81-83	NTIS (US Sales Only), PC A02/MF A01	DE82700445	MN -37	7:32452
10-81-315	NTIS (US Sales Only), PC A02/MF A01	DE82700481	MN -32	7:32409
10-81-316	NTIS (US Sales Only), PC A02/MF A01	DE82700482	MN -32	7:32410
10-81-342	NTIS (US Sales Only), PC A02/MF A01	DE82700483	MN -32	7:32916
11-12133	NTIS (US Sales Only), PC A02/MF A01	DE82700461	MN -32	7:32917
13-81-18	NTIS (US Sales Only), PC A02/MF A01	DE82700426	MN -37	7:32411
13-81-74	NTIS (US Sales Only), PC A02/MF A01	DE82700428	MN -37	7:32412
13-81-298	NTIS (US Sales Only), PC A02/MF A01	DE82700427	MN -37	7:32413
13-12037	NTIS (US Sales Only), PC A02/MF A01	DE82700425	MN -37	7:32002
14-80-793	NTIS (US Sales Only), PC A02/MF A01	DE82700190	MN -34C	7:32813

Report No.	Availability	Order No.	Distribution Category	Abstract No.
14-81-177	NTIS (US Sales Only), PC A02/MF A01	DE82700097	MN -34A	7:32154
15-80-762	NTIS (US Sales Only), PC A02/MF A01	DE82700224	MN -34C	7:32794
15-80-786	NTIS (US Sales Only), PC A02/MF A01	DE82700225	MN -34C	7:32771
15-81-151	NTIS (US Sales Only), PC A02/MF A01	DE82700226	MN -34C	7:32786
16-80-448	NTIS (US Sales Only), PC A02/MF A01	DE82700429	MN -37	7:32003
16-81-330	NTIS (US Sales Only), PC A02/MF A01	DE82700430	MN -37	7:32414
17-80-814	NTIS (US Sales Only), PC A02/MF A01	DE82700098	MN -34A	7:32707
Juel-				
1669	NTIS (US Sales Only), PC A05/MF A01	DE82902153	MN -4	7:32212
1672	NTIS (US Sales Only), PC A04/MF A01	DE82780290	MN -32	7:32918
Juel-Spez-				
88	NTIS (US Sales Only), PC A04/MF A01	DE82780100	MN -80	7:32283
KAERI/RR-				
201/ 80	NTIS (US Sales Only), PC A06/MF A01	DE82700372	MN -80	7:31974
210/ 80	NTIS (US Sales Only), PC A08/MF A01	DE82700241	MN -51	7:32197
218/ 80	NTIS (US Sales Only), PC A07/MF A01	DE82700431	MN -37	7:32415
221/ 80	NTIS (US Sales Only), PC A09/MF A01	DE82700360	MN -80	7:31985
222/ 80	NTIS (US Sales Only), PC A05/MF A01	DE82700385	MN -78	7:31922
223/ 80	NTIS (US Sales Only), PC A07/MF A01	DE82700386	MN -78	7:31923
224/ 80	NTIS (US Sales Only), PC A06/MF A01	DE82700381	MN -80	7:31997
225/ 80	NTIS (US Sales Only), PC A06/MF A01	DE82700387	MN -78	7:31924
226/ 80	NTIS (US Sales Only), PC A08/MF A01	DE82700388	MN -78	7:31925
231/ 80	NTIS (US Sales Only), PC A06/MF A01	DE82700373	MN -80	7:32032
236/ 80	NTIS (US Sales Only), PC A05/MF A01	DE82700446	MN -37	7:31939
238/ 80	NTIS (US Sales Only), PC A04/MF A01	DE82700447	MN -37	7:31940
241/ 80	NTIS (US Sales Only), PC A03/MF A01	DE82700252	MN -4	7:32236
242/ 80	NTIS (US Sales Only), PC A14/MF A01	DE82700379	MN -80	7:31941
243/ 80	NTIS (US Sales Only), PC A09/MF A01	DE82700396	MN -80	7:31926
244/ 80	NTIS (US Sales Only), PC A04/MF A01	DE82700243	MN -4	7:32198
245/ 80	NTIS (US Sales Only), PC A07/MF A01	DE82700380	MN -80	7:31994
247/ 80	NTIS (US Sales Only), PC A06/MF A01	DE82700432	MN -37	7:31995
256/ 80	NTIS (US Sales Only), PC A03/MF A01	DE82700130	MN -20	7:31786
262/ 80	NTIS (US Sales Only), PC A10/MF A01	DE82700448	MN -37	7:32453
267/ 80	NTIS (US Sales Only), PC A03/MF A01	DE82700099	MN -34A	7:32814
272/ 80	NTIS (US Sales Only), PC A03/MF A01	DE82700244	MN -4	7:32199
275/ 80	NTIS (US Sales Only), PC A04/MF A01	DE82700131	MN -20	7:32897
KEK-				
79-34	NTIS (US Sales Only), PC A14/MF A01	DE82780219	MN -28	7:32352
KFK-				
2856	NTIS (US Sales Only), PC A03/MF A01	DE82780093	MN -80	7:31947
2974	NTIS (US Sales Only), PC A03/MF A01	DE82780285	MN -34C	7:32781
3051	NTIS (US Sales Only), PC A08/MF A01	DE82780255	MN -25	7:32764
3078	NTIS (US Sales Only), PC A02/MF A01	DE82780279	MN -25	7:32173
3084	NTIS (US Sales Only), PC A05/MF A01	DE82780091	MN -85	7:31791
3088	NTIS (US Sales Only), PC A03/MF A01	DE82780278	MN -25	7:32174
3142	NTIS (US Sales Only), PC A04/MF A01	DE82780257	MN -38	7:32272
3163	NTIS (US Sales Only), PC A05/MF A01	DE82780258	MN -38	7:32273
3164	NTIS (US Sales Only), PC A11/MF A01	DE82780259	MN -38	7:32274
3165	NTIS (US Sales Only), PC A03/MF A01	DE82780260	MN -38	7:32275
3170	NTIS (US Sales Only), PC A05/MF A01	DE82780299	MN -38	7:32720
KFTI-				
80-37	NTIS (US Sales Only), PC A06/MF A01	DE82780214	MN -20	7:32874
80-45	NTIS (US Sales Only), PC A02/MF A01	DE82700353	MN -28	7:32353
80-46	NTIS (US Sales Only), PC A04/MF A01	DE82780211	MN -34A	7:32708
80-48	NTIS (US Sales Only), PC A06/MF A01	DE82780212	MN -34A	7:32815
81-15	NTIS (US Sales Only), PC A02/MF A01	DE82700271	MN -25	7:32155
KIYI-				
80-8	NTIS (US Sales Only), PC A02/MF A01	DE82700433	MN -37	7:32416
KURRI-TR-				
197	NTIS (US Sales Only), PC A06/MF A01	DE82780220	MN -78	7:31927
LA-				
8826-PR	NTIS, PC A06/MF A01	DE82010983	STD -90i	7:31728
8870-PR	NTIS, PC A05/MF A01	DE82007014	STD -15	7:31819
8872	NTIS, PC A10/MF A01	DE82007360	STD -32	7:32276
8959-PR	NTIS, PC A04/MF A01	DE82010987	STD -70	7:31795
8983	NTIS, PC A02/MF A01	DE82007356	STD -11	7:31750
9002-MS	NTIS, PC A04/MF A01	DE82007013	STD -15	7:31820
9026	NTIS, PC A02/MF A01	DE82007357	STD -34C	7:32795
9052-MS	NTIS, PC A02/MF A01	DE82007030	STD -70	7:31955
9071-MS	NTIS, PC A03/MF A01	DE82010975	STD -59c	7:31869
9121-MS	NTIS, PC A05/MF A01	DE82007054	STD -34	7:32835
9125-MS	NTIS, PC A02/MF A01	DE82007082	STD -78	7:31928
LA-UR-				
81-3057	NTIS, PC A02/MF A01	DE82006126	MN -28	7:32325
81-3058	NTIS, PC A02/MF A01	DE82006128	MN -28	7:32326
81-3071	NTIS, PC A02/MF A01	DE82002371	MN -96	7:32130
81-3204	NTIS, PC A02/MF A01	DE82002349	MN -48	7:32587
81-3558	NTIS, PC A02/MF A01	DE82006108	MN -32	7:32919
81-3573	NTIS, PC A02/MF A01	DE82006105	MN -11	7:32474
81-3590	NTIS, PC A02/MF A01	DE82006106	MN -34D	7:32836
81-3610	NTIS, PC A02/MF A01	DE82006104	MN -66e	7:31879
81-3636	NTIS, PC A02/MF A01	DE82006154	MN -34D	7:32754
81-3700	NTIS, PC A02/MF A01	DE82006136	MN -11	7:32594
LBL-				
13400	NTIS, PC A12/MF A01	DE82005842	MN -93d	7:32112

Report No.	Availability	Order No.	Distribution Category	Abstract No.
13421	*See* DOE/ER/10389-2	DE82006304	MN -25	7:32142
13593	NTIS, PC A05/MF A01	DE82005651	MN -34D	7:32709
13623	NTIS, PC A08/MF A01	DE82005803	MN -25	7:32156
13669	NTIS, PC A08/MF A01	DE82005626	MN -61	7:31829
LBL-PUB-				
426	NTIS, PC A02/MF A01	DE82004953	MN -2	7:32354
M-				
10	*See* NP-2902054		MN -41	7:31892
MLM-				
2884	NTIS, PC A03/MF A01	DE82006218	STD -4	7:31825
MLM-MU-				
81-72-0002	NTIS, PC A08/MF A01	DE82005667	MN -90c	7:31718
81-72-0003-Vol.1	NTIS, PC A04/MF A01	DE82006141	MN -70	7:31796
MP-				
81-174	*See* DOE/ET/53025-T10	DE82002137	MN -20g	7:32696
NASA-CR-				
165182	*See* DOE/NASA/0124-6	DE82010113	STD -96	7:32131
NASA-TM-				
82734	*See* DOE/NASA/10769-21	DE82007562	STD -90g	7:32109
82751	*See* DOE/NASA/20320-34	DE82007020	STD -60	7:31898
NEANDC(J)-				
74/ AU	*See* JAERI-M-9714	DE82901989	MN -34C	7:32776
80/ U	Information Section, Division of Technical Information, Japan Atomic Energy Research Institute, Tokai-mura, Naka-gun, Ibaraki-ken 319-11, Japan		ND -34C	7:32770
NIIAR-				
15(468)	NTIS (US Sales Only), PC A02/MF A01	DE82700332	MN -38	7:31958
41(449)	NTIS (US Sales Only), PC A02/MF A01	DE82700434	MN -37	7:32417
NIIEFA-P-K-				
0470	NTIS (US Sales Only), PC A03/MF A01	DE82700132	MN -20	7:32898
0488	NTIS (US Sales Only), PC A02/MF A01	DE82700133	MN -20	7:32899
NLCO-				
008EV	NTIS, PC A04/MF A01	DE82005853	STD -70A	7:31797
NP-				
2900604	NTIS (US Sales Only), PC A08/MF A01	DE82900604	MN -98G	7:32119
2900605	NTIS (US Sales Only), PC A04/MF A01	DE82900605	MN -96	7:32120
2900612	NTIS (US Sales Only), PC A02/MF A01	DE82900612	MN -61a	7:32307
2900614	NTIS (US Sales Only), PC A04/MF A01	DE82900614	MN -95e	7:32095
2900741	NTIS (US Sales Only), PC A12/MF A01	DE82900741	MN -95f	7:32113
2900949	NTIS (US Sales Only), PC A14/MF A01	DE82900949	MN -88	7:32252
2900953	NTIS (US Sales Only), PC A05/MF A01	DE82900953	MN -95	7:32114
2900958	NTIS (US Sales Only), PC A04/MF A01	DE82900958	MN -58d	7:31870
2901002	NTIS (US Sales Only), PC A03/MF A01	DE82901002	MN -95d	7:32115
2901005	NTIS (US Sales Only), PC A03/MF A01	DE82901005	MN -98	7:31735
2901006	NTIS (US Sales Only), PC A02/MF A01	DE82901006	MN -25	7:32168
2901045	NTIS (US Sales Only), PC A04/MF A01	DE82901045	MN -92	7:31767
2901046	NTIS (US Sales Only), PC A03/MF A01	DE82901046	MN -92	7:31748
2901047	NTIS (US Sales Only), PC A04/MF A01	DE82901047	MN -13	7:32073
2901048	NTIS (US Sales Only), PC A04/MF A01	DE82901048	MN -97b	7:32100
2901049	NTIS (US Sales Only), PC A06/MF A01	DE82901049	MN -94c	7:32070
2901051	NTIS (US Sales Only), PC A06/MF A01	DE82901051	MN -88	7:31736
2901052	NTIS (US Sales Only), PC A04/MF A01	DE82901052	MN -98E	7:32103
2901053	NTIS (US Sales Only), PC A02/MF A01	DE82901053	MN -98	7:32088
2901054	NTIS (US Sales Only), PC A02/MF A01	DE82901054	MN -92b	7:31753
2901055	NTIS (US Sales Only), PC A03/MF A01	DE82901055	MN -98F	7:32097
2901082	NTIS (US Sales Only), PC A08/MF A01	DE82901082	MN -98	7:32076
2901083	NTIS (US Sales Only), PC A07/MF A01	DE82901083	MN -11	7:32081
2901084	NTIS (US Sales Only), PC A09/MF A01	DE82901084	MN -25	7:32157
2901085	NTIS (US Sales Only), PC A02/MF A01	DE82901085	MN -95	7:32090
2901089	NTIS (US Sales Only), PC A08/MF A01	DE82901089	MN -32	7:32101
2901091	NTIS (US Sales Only), PC A04/MF A01	DE82901091	MN -92a	7:31751
2901095	NTIS (US Sales Only), PC A06/MF A01	DE82901095	MN -38	7:32277
2901104	NTIS (US Sales Only), PC A08/MF A01	DE82901104	MN -61a	7:31842
2901105	NTIS (US Sales Only), PC A05/MF A01	DE82901105	MN -97c	7:31901
2901106	NTIS (US Sales Only), PC A07/MF A01	DE82901106	MN -97a	7:31912
2901108	NTIS (US Sales Only), PC A07/MF A01	DE82901108	MN -13	7:32911
2901109	NTIS (US Sales Only), PC A07/MF A01	DE82901109	MN -96	7:32126
2901180	NTIS, PC A03/MF A01	DE82901180	MN -95f	7:31754
2901424	NTIS (US Sales Only), PC A02/MF A01	DE82901424	MN -98	7:32075
2901471	NTIS, PC A02/MF A01	DE82901471	MN -61a	7:31843
2901472	NTIS, PC A04/MF A01	DE82901472	MN -61a	7:31844
2901890	NTIS, PC A06/MF A01	DE82901890	MN -95	7:32093
2902045	CIR/BOSTI, National Academy of Sciences, 2101 Constitution Ave., Washington, DC 20418		MN -61a	7:31845
2902054	California Division of Oil & Gas, Dept. of Cons., 1416 9th St., Room 1310, Sacramento, CA 95814		MN -41	7:31892
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2902508	Wyoming Geological Survey, Box 3008, University Station, Laramie, WY 82070		MN -66	7:32596

Report No.	Availability	Order No.	Distribution Category	Abstract No.
2902698	New Mexico Energy Research and Development Inst., P.O. Box 5307, Santa Fe, NM 87502		MN -51	7:31784
2903288	Dept. of Industry, Ashdown House, 123 Victoria Street, London SW1E 6RB, England			7:32123
2903327	State of Illinois-Dept. of Energy and Natural Resources, 309 W. Washington St., Chicago, IL 60606		MN -13	7:32096
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82901096	NTIS (US Sales Only), PC A08/MF A01	DE82901096	MN -98F	7:32084
NRPB-R-				
113	NTIS (US Sales Only), PC A03/MF A01	DE82700435	MN -37	7:32418
NSSRP-				
38	*See* UTTAC-38	DE82700235	MN -34C	7:32782
NUREG/CR-				
2204-Vol.3	NTIS, PC A02/MF A01	DE82005655	MN -78	7:31929
2220-Vol.1	NTIS, PC A18/MF A01	DE82006952	MN -11	7:32526
2408	NTIS, PC A03/MF A01	DE82005787	MN -78	7:31916
NYSERDA-				
80-36	NTIS, PC A03/MF A01	DE82901432	MN -94c	7:32071
ORAU-				
190	NTIS, PC A02/MF A01	DE82005807	MN -86	7:31788
ORNL/CSD/TM-				
146	NTIS, PC A03/MF A01	DE82007130	MN -20g	7:32900
166	NTIS, PC A02/MF A01	DE82007470	MN -32	7:32920
ORNL/MIT-				
336	NTIS, PC A03/MF A01	DE82006978	MN -20	7:31848
337	NTIS, PC A04/MF A01	DE82007500	MN -70	7:31799
ORNL/NUREG/TM-				
385/ VI	*See* NUREG/CR-2220-Vol.1	DE82006952	MN -11	7:32526
ORNL/Sub-				
81/ 21086/ 2	NTIS, PC A05/MF A01	DE82007654	MN -20a	7:32901
7435/ 1	NTIS, PC A03/MF A01	DE82007115	MN -97d	7:31902
7435/ 2	NTIS, PC A09/MF A01	DE82006938	MN -97b	7:31903
7537/ 15	NTIS, PC A08/MF A01	DE82007498	STD -78	7:31917
ORNL/TM-				
7628	NTIS, PC A03/MF A01	DE82007131	STD -70	7:32527
7788	NTIS, PC A06/MF A01	DE82007501	MN -11	7:32528
7841	NTIS, PC A03/MF A01	DE82006955	MN -80	7:32004
7978	NTIS, PC A03/MF A01	DE82007475	MN -80	7:32005
7979	NTIS, PC A03/MF A01	DE82006973	MN -80	7:32006
8029	NTIS, PC A03/MF A01	DE82007133	MN -80	7:32007
8030	NTIS, PC A03/MF A01	DE82006956	STD -86	7:31789
8061	NTIS, PC A07/MF A01	DE82007128	STD -70	7:31956
8063	NTIS, PC A04/MF A01	DE82007124	STD -20g	7:32875
8081	*See* NUREG/CR-2408	DE82005787	MN -78	7:31916
8147	NTIS, PC A02/MF A01	DE82007134	MN -80	7:32011
8162	*See* NUREG/CR-2204-Vol.3	DE82005655	MN -78	7:31929
8169	NTIS, PC A02/MF A01	DE82007111	MN -80	7:32012
ORNL-tr-				
4797	NTIS, PC A06/MF A01	DE82005494	MN -79	7:31975
ORO-				
3346-244	*See* DOE/ER/03346-T1	DE82004631	MN -34C	7:32787
PATENTS-US-	(US: Commissioner of Patents, Washington, D.C. 20231, USA, $.50 per copy. Government Patent Applications available from NTIS)			
A 092,801				7:32271
A 177,978				7:32492
A 180,373				7:32584
A 229,424		DE82004452		7:32462
A 229,496		DE82004456		7:32461
A 229,497		DE82004464		7:32463
A 300,763				7:32268
4,299,168				7:32072
4,299,648				7:32186
4,301,425				7:32265
4,302,311				7:31823
4,305,780				7:31813
4,306,879				7:31891
4,307,679				7:31812
4,308,750				7:32162
4,309,307				7:32423
4,309,398				7:32213
4,309,467				7:32175
4,311,409				7:31811
4,313,070				7:32284
PB-				
81-245011	NTIS, PC A09/MF A01		MN -88	7:31729
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82-134883	Geological Survey, Denver, CO			7:31772
82-135260	National Bureau of Standards, Washington, DC			7:31833
82-143611	NTIS, PC A06/MF A01			7:32118
82-157553	NTIS, PC A03/MF A01			7:31880
PEL-				
275	NTIS (US Sales Only), PC A02/MF A01	DE82700436	MN -37	7:32419
277	NTIS (US Sales Only), PC A02/MF A01	DE82700437	MN -37	7:32420
PER-				
61	NTIS (US Sales Only), PC A05/MF A01	DE82700485	MN -51	7:31785
PFC/RR-				
81-31	*See* DOE/ET/51013-27	DE82004871	STD -20	7:32848
PLF-				
31	NTIS (US Sales Only), PC A06/MF A01	DE82780105	MN -34A	7:32710
39	NTIS (US Sales Only), PC A06/MF A01	DE82780288	MN -20	7:32876
PNE-				
81-150	NTIS, PC A03/MF A01	DE82004896	MN -79e	7:32008
PNL-SA-				
8408	NTIS, PC A02/MF A01	DE82007636	MN -70	7:31800
8604	NTIS, PC A03/MF A01	DE82005911	MN -70	7:31801
8705	NTIS, PC A02/MF A01	DE82006088	MN -11	7:32475
8813	NTIS, PC A02/MF A01	DE82005912	MN -90d	7:31747
8927	NTIS, PC A02/MF A01	DE82005872	MN -70	7:31802
8945	NTIS, PC A02/MF A01	DE82005902	MN -4	7:32200
8992	NTIS, PC A02/MF A01	DE82005903	MN -4	7:31817
9014	NTIS, PC A02/MF A01	DE82005883	MN -11	7:32498
9020	NTIS, PC A02/MF A01	DE82006085	MN -4	7:31719
9057	NTIS, PC A02/MF A01	DE82006163	MN -11	7:31831
9100	NTIS, PC A02/MF A01	DE82006079	MN -78	7:31918
9133	NTIS, PC A02/MF A01	DE82005884	MN -41	7:32572
9311	NTIS, PC A02/MF A01	DE82005981	MN -11	7:32480
9440	NTIS, PC A02/MF A01	DE82005982	MN -70	7:31803
9441	NTIS, PC A02/MF A01	DE82005979	MN -79e	7:31948
9503	NTIS, PC A02/MF A01	DE82006167	MN -70	7:31818
9630	NTIS, PC A02/MF A01	DE82005905	MN -11	7:32470
9739	NTIS, PC A02/MF A01	DE82005917	MN -70	7:31804
9759	NTIS, PC A02/MF A01	DE82006882	MN -20c	7:32158
9805	NTIS, PC A02/MF A01	DE82005930	MN -91	7:31776
9806	NTIS, PC A02/MF A01	DE82005904	MN -13	7:31730
9848	NTIS, PC A02/MF A01	DE82005874	MN -70	7:32602
9891	NTIS, PC A02/MF A01	DE82006026	MN -62	7:32067
9975	NTIS, PC A03/MF A01	DE82005224	MN -61a	7:31849
9982	NTIS, PC A02/MF A01	DE82005804	MN -61a	7:31850
9984	NTIS, PC A02/MF A01	DE82005934	MN -32	7:32921
10019	NTIS, PC A02/MF A01	DE82005839	MN -70	7:31805
10022	NTIS, PC A02/MF A01	DE82005781	MN -70	7:31792
PRI-				
34	*See* SAI-254-81-387-LJ	DE82006016	STD -20g	7:32877
PUC-tn-				
02/ 80	NTIS (US Sales Only), PC A02/MF A01	DE82700281	MN -51	7:32521
05/ 80	NTIS (US Sales Only), PC A02/MF A01	DE82700100	MN -34A	7:32837
07/ 80	NTIS (US Sales Only), PC A02/MF A01	DE82700101	MN -34A	7:32159
14/ 79	NTIS (US Sales Only), PC A02/MF A01	DE81700955	MN -4	7:32201
17/ 80	NTIS (US Sales Only), PC A02/MF A01	DE82700102	MN -34A	7:32838
18/ 79	NTIS (US Sales Only), PC A02/MF A01	DE81700928	MN -34A	7:32839
22/ 80	NTIS (US Sales Only), PC A02/MF A01	DE82700245	MN -4	7:32202
24/ 80	NTIS (US Sales Only), PC A02/MF A01	DE82700246	MN -4	7:32203
RHO-BWI-C-				
86	NTIS, PC A06/MF A01	DE82007011	MN -70	7:31806
RHO-LD-				
165	NTIS, PC A05/MF A01	DE82006951	MN -70	7:31807
RHO-SA-				
216	NTIS, PC A02/MF A01	DE82005749	MN -70	7:32534
RI-				
120	NTIS (US Sales Only), PC A02/MF A01	DE82700356	MN -28	7:32711
136	NTIS (US Sales Only), PC A02/MF A01	DE82700449	MN -37	7:31787
Riso-M-				
2153	NTIS (US Sales Only), PC A07/MF A01	DE82900609	MN -60	7:31900

Report No.	Availability	Order No.	Distribution Category	Abstract No.
2301	NTIS (US Sales Only), PC A04/MF A01; Also available from Risoe Library, DK-4000 Roskilde, Denmark	DE81701004	MN -80	7:31957
RL-				
81-053	NTIS (US Sales Only), PC A02/MF A01	DE82700438	MN -37	7:32421
81-054	NTIS (US Sales Only), PC A02/MF A01	DE82700357	MN -28	7:32846
81-061	NTIS (US Sales Only), PC A03/MF A01	DE82700358	MN -28	7:32355
SAI-				
254-81-387-LJ	NTIS, PC A03/MF A01	DE82006016	STD -20g	7:32877
SAND-				
80-0064	NTIS, PC A03/MF A01	DE82007553	MN -51	7:31781
80-2056	NTIS, PC A09/MF A01	DE82007004	MN -32	7:32922
80-2627	NTIS, PC A04/MF A01	DE82006875	MN -80	7:32033
81-0135-Rev.1	NTIS, PC A03/MF A01	DE82007559	STD -63	7:31858
81-1048	NTIS, PC A06/MF A01	DE82007005	STD -70	7:31808
81-1729C	NTIS, PC A02/MF A01	DE82006283	MN -38	7:32847
81-1882	NTIS, PC A03/MF A01	DE82007098	MN -70	7:31809
81-1927	NTIS, PC A03/MF A01	DE82007558	MN -32	7:32923
81-1952	NTIS, PC A02/MF A01	DE82006873	MN -38	7:32160
81-2476	NTIS, PC A03/MF A01	DE82006878	MN -32	7:32924
81-2567	NTIS, PC A06/MF A01	DE82007095	MN -70	7:32184
81-7027	NTIS, PC A10/MF A01	DE82006994	MN -63a	7:31834
81-7086/ 5	NTIS, PC A03/MF A01	DE82007566	MN -63d	7:31859
81-7090/ 4	NTIS, PC A03/MF A01	DE82007565	MN -63d	7:31860
82-0025C	NTIS, PC A02/MF A01	DE82006299	MN -38	7:32185
82-0061C	NTIS, PC A02/MF A01	DE82006295	MN -32	7:32925
SERI-				
0637-4	NTIS, PC A20/MF A01	DE82000718	MN -62	7:31872
SERI/PR-				
8143-1-T5	NTIS, PC A03/MF A01	DE82005254	STD -63	7:31851
9195-1-T3	NTIS, PC A03/MF A01	DE82006886	MN -63	7:31852
SERI/TP-				
211-1494	NTIS, PC A02/MF A01	DE82007001	MN -63b	7:31853
254-1482	NTIS, PC A02/MF A01	DE82006117	MN -59c	7:32116
SERI/TR-				
663-1032	NTIS, PC A04/MF A01	DE82007002	MN -59	7:31873
SFTI-				
10	NTIS (US Sales Only), PC A02/MF A01	DE82700134	MN -20	7:32878
SLAC-PUB-				
2835	NTIS, PC A02/MF A01	DE82005273	MN -32	7:32926
SOLAR/0909-				
81/ 70	NTIS, PC A03/MF A01	DE82006139	STD -59	7:31874
SV-FUD-				
4-2	NTIS (US Sales Only), PC A04/MF A01	DE81701005	MN -80	7:31904
UCID-				
18253	NTIS, PC A02/MF A01	DE82006866	MN -2	7:32469
19206	NTIS, PC A02/MF A01	DE82010991	MN -20	7:32902
19268	NTIS, PC A03/MF A01	DE82006929	MN -32	7:32927
19280	NTIS, PC A02/MF A01	DE82005693	MN -90c	7:31720
19291	NTIS, PC A03/MF A01	DE82010992	MN -66b	7:31896
19300	NTIS, PC A04/MF A01	DE82007145	MN -11	7:32481
UCLA-				
12/ 1311	NTIS, PC A06/MF A01	DE82005441	MN -62	7:31863
UCRL-				
15423	NTIS, PC A07/MF A01	DE82006923	MN -66b	7:31882
15426-Vol.1	NTIS, PC A06/MF A01	DE82005512	MN -37	7:32458
15426-Vol.2	NTIS, PC A05/MF A01	DE82006862	MN -37	7:32459
85944	NTIS, PC A03/MF A01	DE82005701	MN -4	7:32237
86160	NTIS, PC A02/MF A01	DE82006926	MN -21	7:31822
86341	NTIS, PC A02/MF A01	DE82006795	MN -32	7:32928
86438	NTIS, PC A02/MF A01	DE82006740	MN -38	7:32254
86500	NTIS, PC A02/MF A01	DE82006742	MN -32	7:32929
86964	NTIS, PC A02/MF A01	DE82005869	MN -34C	7:32606
87037	NTIS, PC A03/MF A01	DE82005698	MN -21	7:32903
87038	NTIS, PC A02/MF A01	DE82006931	MN -21	7:32904
UILU-ENG-				
81-1724	*See* UIUCDCS-R-81-1064	DE82006906	MN -32	7:32930
UIUC-ENG-				
81-1722	*See* UIUCDCS-R-81-1072	DE82005330	MN -32	7:32304
UIUCDCS-R-				
81-1064	NTIS, PC A04/MF A01	DE82006906	MN -32	7:32930
81-1072	NTIS, PC A04/MF A01	DE82005330	MN -32	7:32304
USC-				
113P19-77	NTIS, PC A02/MF A01	DE82005347	MN -38	7:32816
113P19-78	NTIS, PC A03/MF A01	DE82005346	MN -32	7:32931
113P-66	NTIS, PC A02/MF A01	DE82005362	MN -38	7:32932
USGS-OFR-				
80-450	NTIS, PC A12/MF A01	DE82010967	MN -70	7:31810
UTTAC-				
38	NTIS (US Sales Only), PC A02/MF A01	DE82700235	MN -34C	7:32782
39	NTIS (US Sales Only), PC A02/MF A01	DE82700236	MN -34C	7:32791
WFPS-TME-				
81-026	*See* ORNL/Sub-81/21086/2	DE82007654	MN -20a	7:32901
Y-				
2264	NTIS, PC A02/MF A01	DE82006017	STD -38	7:32255

Report No.	Availability	Order No.	Distribution Category	Abstract No.
Y/DK-285	NTIS, PC A02/MF A01	DE82005669	MN -4	7:32204
Y/DW-282	NTIS, PC A02/MF A01	DE82007334	MN -25	7:32161
Y/EN-611	NTIS, PC A03/MF A01	DE82007205	MN -38	7:32256

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Order No.	*Report No.*
DE81700787	IAE—3144
DE81700896	EUR—7008
DE81700928	PUC-tn—18/79
DE81700955	PUC-tn—14/79
DE81700959	INR—1746/17/C/A
DE81700994	CTA-EAV—007/79
DE81700996	CTA-EAV-NT—011/79
DE81700997	IEA-DT—148
DE81700999	AEEW-M—1830
DE81701000	CEA-N—2213
DE81701002	JEN—500
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DE81701004	RISO-M—2301
DE81701005	SV-FUD—4-2
DE81701011	IAEA-R—2051-F
DE82000718	CONF-780956—
DE82000718	SERI—0637-4
DE82002137	DOE/ET/53025—T10
DE82002137	MP—81-174
DE82002252	DOE/SF/10838—T1
DE82002297	DOE/ET/12074—T3
DE82002349	CONF-811086—2
DE82002349	LA-UR—81-3204
DE82002371	CONF-811212—2
DE82002371	LA-UR—81-3071
DE82002537	DOE-tr—248
DE82002544	DOE-tr—249
DE82002729	CONF-810969—2
DE82002729	IAEA-CN—40/74P
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DE82003870	CONF-810831—78
DE82003870	DOE/ER/10107—3
DE82003871	CONF-810831—77
DE82003871	DOE/ER/10107—4
DE82004056	CONF-811103—69
DE82004057	CONF-811103—68
DE82004085	CONF-801152—3
DE82004208	CONF-8110125—1
DE82004347	CONF-811171—1
DE82004347	DP-MS—81-72
DE82004401	CONF-810770—2
DE82004401	FERMILAB-Conf—81/80-Exp.
DE82004452	PATENTS-US—A
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DE82004464	PATENTS-US—A
DE82004536	DOE/ET/12074—T1
DE82004554	IG—114
DE82004631	DOE/ER/03346—T1
DE82004631	ORO—3346-244
DE82004645	DOE/TIC—3387
DE82004871	DOE/ET/51013—27
DE82004871	PFC/RR—81-31
DE82004885	DOE/ER/10575—2
DE82004896	COO—2826-15
DE82004896	PNE—81-150
DE82004897	DOE/ER/04861—3
DE82004898	DOE/ER/10381—3
DE82004904	DOE/IR/10905—20
DE82004905	DOE/ET/20618—T1
DE82004906	DOE/ER/00913—2
DE82004941	DOE/PC/30222—T2
DE82004953	LBL-PUB—426
DE82005090	DOE/FE/00080—2
DE82005102	CONF-790526—3
DE82005193	CONF-811214—6
DE82005208	DOE/PC/40778—T1
DE82005224	CONF-8110115—2
DE82005224	PNL-SA—9975
DE82005236	BNL—30337
DE82005236	CONF-811012—47
DE82005246	DOE/ET/13354—T1
DE82005250	DOE/TIC—2005250
DE82005250	IDO—10086(80)
DE82005254	SERI/PR—8143-1-T5
DE82005273	CONF-811012—48
DE82005273	SLAC-PUB—2835
DE82005296	DOE/SF/11436—1-Exect.Summ.
DE82005306	DOE/ER/02313—11
DE82005330	COO—2383-0081
DE82005330	UIUC-ENG—81-1722
DE82005330	UIUCDCS-R—81-1072
DE82005334	DOE/ER/10727—T1
DE82005346	USC—113P19-78
DE82005347	USC—113P19-77
DE82005362	USC—113P-66
DE82005369	DOE/SF/10763—T13
DE82005412	DOE/CS/51213—T20
DE82005438	DOE/PC/40797—1
DE82005441	UCLA—12/1311
DE82005469	DOE/EV/04500—2
DE82005484	DOE/EV/10610—01
DE82005489	DOE/ET/21002—T21
DE82005494	ORNL-tr—4797
DE82005498	EPRI-NP—526-Vol.4,Pt.2
DE82005502	BNL—30432
DE82005502	CONF-811172—1
DE82005503	BNL—30322
DE82005503	CONF-8110143—1
DE82005509	BNL—30356
DE82005509	CONF-810992—3
DE82005511	BNL—30551
DE82005511	CONF-8110144—1
DE82005512	UCRL—15426-Vol.1
DE82005518	DOE/ER/40033—13
DE82005626	LBL—13669
DE82005631	DOE/ER/10890—1
DE82005645	EGG-M—02381
DE82005651	LBL—13593
DE82005655	NUREG/CR—2204-Vol.3
DE82005655	ORNL/TM—8162
DE82005667	MLM-MU—81-72-0002
DE82005669	Y/DK—285
DE82005676	DOE/AL/16223—1
DE82005693	UCID—19280
DE82005695	BNL—27818
DE82005698	CONF-820107—2
DE82005698	UCRL—87037
DE82005701	CONF-810948—3
DE82005701	UCRL—85944
DE82005749	CONF-8105118—2
DE82005749	RHO-SA—216
DE82005765	GA-A—16558
DE82005770	DOE/TIC—7000-R5(App.)
DE82005781	CONF-811130—15
DE82005781	PNL-SA—10022
DE82005787	NUREG/CR—2408
DE82005787	ORNL/TM—8081
DE82005803	LBL—13623
DE82005804	CONF-811212—11
DE82005804	PNL-SA—9982
DE82005807	ORAU—190
DE82005808	DOE/ET/20356—5
DE82005811	DOE/CS/54209—4
DE82005812	DOE/JPL—1012-61
DE82005839	CONF-811130—16
DE82005839	PNL-SA—10019
DE82005842	LBL—13400
DE82005849	DOE/BC/10003—19
DE82005853	NLCO—008EV
DE82005869	CONF-811174—2
DE82005869	UCRL—86964
DE82005872	CONF-801209—10
DE82005872	PNL-SA—8927
DE82005874	PNL-SA—9848
DE82005883	CONF-810436—5
DE82005883	PNL-SA—9014
DE82005884	CONF-810606—103
DE82005884	PNL-SA—9133
DE82005902	CONF-810409—5
DE82005902	IAEA-SM—252/25
DE82005902	PNL-SA—8945
DE82005903	CONF-810409—6
DE82005903	IAEA-SM—252/18
DE82005903	PNL-SA—8992
DE82005904	CONF-8106109—5
DE82005904	PNL-SA—9806
DE82005905	CONF-8106152—2
DE82005905	PNL-SA—9630
DE82005911	CONF-8006214—1
DE82005911	PNL-SA—8604
DE82005912	CONF-8009103—2
DE82005912	PNL-SA—8813
DE82005917	CONF-810897—2
DE82005917	PNL-SA—9739
DE82005930	CONF-8106109—4
DE82005930	PNL-SA—9805
DE82005934	CONF-811214—5
DE82005934	PNL-SA—9984
DE82005951	CONF-810801—59
DE82005955	CONF-810842—3
DE82005979	CONF-810804—23
DE82005979	PNL-SA—9441
DE82005981	CONF-810505—6
DE82005981	PNL-SA—9311
DE82005982	CONF-810650—3
DE82005982	PNL-SA—9440
DE82006010	DOE/CS/20295—1
DE82006016	PRI—34
DE82006016	SAI—254-81-387-LJ
DE82006017	Y—2264
DE82006026	CONF-811066—7
DE82006026	PNL-SA—9891
DE82006079	CONF-810606—104
DE82006079	PNL-SA—9100
DE82006085	CONF-8104135—1
DE82006085	PNL-SA—9020
DE82006088	CONF-810306—8
DE82006088	PNL-SA—8705
DE82006099	DOE/MA—0047
DE82006104	CONF-820107—3
DE82006104	LA-UR—81-3610
DE82006105	CONF-8110141—1

Order No.	Report No.
DE82006105	LA-UR—81-3573
DE82006106	CONF-810385—5
DE82006106	LA-UR—81-3590
DE82006108	CONF-820204—1
DE82006108	LA-UR—81-3558
DE82006117	CONF-820112—1
DE82006117	SERI/TP—254-1482
DE82006121	CEND—395
DE82006121	DOE/ET/34030—1
DE82006126	CONF-811083—20
DE82006126	LA-UR—81-3057
DE82006128	CONF-811083—17
DE82006128	LA-UR—81-3058
DE82006136	CONF-811173—1
DE82006136	LA-UR—81-3700
DE82006139	SOLAR/0909—81/70
DE82006141	MLM-MU—81-72-0003-Vol.1
DE82006154	CONF-8108108—1
DE82006154	LA-UR—81-3636
DE82006163	CONF-8110146—1
DE82006163	PNL-SA—9057
DE82006167	CONF-810765—2
DE82006167	PNL-SA—9503
DE82006190	DOE/EV/10025—T1
DE82006195	DOE/PC/40793—T1
DE82006209	DOE/R5/10301—1
DE82006215	CONF-811108—15
DE82006215	EGG-M—04481
DE82006218	MLM—2884
DE82006226	DOE/ID/12200—T1
DE82006247	CONF-810746—4
DE82006247	DOE/ER/10856—1
DE82006267	DOE/MC/14036—T1
DE82006267	FE—2762-8
DE82006269	CONF-810831—80
DE82006272	CONF-810812—42
DE82006283	CONF-8106189—1
DE82006283	SAND—81-1729C
DE82006294	DOE/PC/30216—T3
DE82006295	CONF-811219—1
DE82006295	SAND—82-0061C
DE82006299	CONF-820107—4
DE82006299	SAND—82-0025C
DE82006304	DOE/ER/10389—2
DE82006304	LBL—13421
DE82006740	CONF-8110142—1
DE82006740	UCRL—86438
DE82006742	CONF-811214—4
DE82006742	UCRL—86500
DE82006750	DOE/NRS—82/1
DE82006751	CONF-810831—75
DE82006751	DOE/ER/10107—12
DE82006752	CONF-810831—74
DE82006752	DOE/ER/10107—11
DE82006753	CONF-810831—73
DE82006753	DOE/ER/10107—10
DE82006754	CONF-810831—72
DE82006754	DOE/ER/10107—9
DE82006755	CONF-810831—71
DE82006755	DOE/ER/10107—8
DE82006756	CONF-810831—76
DE82006756	DOE/ER/10107—7
DE82006757	CONF-810831—69
DE82006757	DOE/ER/10107—6
DE82006758	CONF-810831—70
DE82006758	DOE/ER/10107—5
DE82006759	DOE/RA/50076—T12
DE82006795	CONF-811168—1
DE82006795	UCRL—86341
DE82006798	DOE/ER/40039—1
DE82006799	DOE/ER/04447—137
DE82006825	DOE/ER/03285—41
DE82006825	JHU-HET—8109
DE82006826	DOE/ET/14746—1
DE82006837	CONF-8009134—2
DE82006838	DOE/ER/04699—7
DE82006839	DOE/ER/05224—5
DE82006841	BNL—51418
DE82006853	DOE/TIC—2006853
DE82006862	UCRL—15426-Vol.2
DE82006866	UCID—18253
DE82006873	SAND—81-1952
DE82006875	SAND—80-2627
DE82006878	SAND—81-2476
DE82006882	CONF-810831—81
DE82006882	PNL-SA—9759
DE82006886	SERI/PR—9195-1-T3
DE82006890	DOE/ER/02640—13
DE82006891	DOE/ER/02026—41
DE82006893	DOE/ET/52018—16
DE82006895	DOE/EV/10380—2
DE82006896	COO—2892-30
DE82006896	DOE/ER/02892—30
DE82006898	CONF-810370—
DE82006903	DOE/ER/10516—10
DE82006904	DOE/TIC—2006904
DE82006905	DOE/ER/01198—1372
DE82006906	UILU-ENG—81-1724
DE82006906	UIUCDCS-R—81-1064
DE82006911	DOE/ER/04433—5
DE82006912	DOE/R5/10222—1
DE82006923	UCRL—15423
DE82006926	CONF-811113—48
DE82006926	UCRL—86160
DE82006929	UCID—19268
DE82006931	CONF-810684—56
DE82006931	UCRL—87038
DE82006932	BNL—30441
DE82006932	CONF-811212—12
DE82006933	BNL—30440
DE82006933	CONF-811212—10
DE82006938	ORNL/Sub—7435/2
DE82006951	RHO-LD—165
DE82006952	NUREG/CR—2220-Vol.1
DE82006952	ORNL/NUREG/TM—385/VI
DE82006955	ORNL/TM—7841
DE82006956	ORNL/TM—8030
DE82006959	DOE/ER/03285—40
DE82006959	JHU-HET—8108
DE82006973	ORNL/TM—7979
DE82006978	ORNL/MIT—336
DE82006994	SAND—81-7027
DE82007001	CONF-811013—16
DE82007001	SERI/TP—211-1494
DE82007002	SERI/TR—663-1032
DE82007004	SAND—80-2056
DE82007005	SAND—81-1048
DE82007006	DOE/PC/30230—23
DE82007011	RHO-BWI-C—86
DE82007012	DOE/PC/40270—3
DE82007013	LA—9002-MS
DE82007014	LA—8870-PR
DE82007020	DOE/NASA/20320—34
DE82007020	NASA-TM—82751
DE82007030	LA—9052-MS
DE82007032	ANL/OEPM—81-7
DE82007036	ANL/AA—26
DE82007037	ANL/OTEC-BCM—023
DE82007040	DOE/ET/20279—153
DE82007054	LA—9121-MS
DE82007065	DOE/TIC—2007065
DE82007082	LA—9125-MS
DE82007095	SAND—81-2567
DE82007098	SAND—81-1882
DE82007111	ORNL/TM—8169
DE82007115	ORNL/SUB—7435/1
DE82007124	ORNL/TM—8063
DE82007128	ORNL/TM—8061
DE82007130	ORNL/CSD/TM—146
DE82007131	ORNL/TM—7628
DE82007133	ORNL/TM—8029
DE82007134	ORNL/TM—8147
DE82007141	GJBX—1-82
DE82007143	GJBX—182-Vol.2B(Mt.Leona)
DE82007145	UCID—19300
DE82007205	Y/EN—611
DE82007247	EPRI-EM—2193-Vol.3
DE82007332	DOE/EV/00936—T3
DE82007334	CONF-820301—2
DE82007334	Y/DW—282
DE82007356	LA—8983
DE82007357	LA—9026
DE82007359	CONF-8007127—1
DE82007359	DOE/CS/40222—2
DE82007360	LA—8872
DE82007468	DOE/ET/29310—1
DE82007470	ORNL/CSD/TM—166
DE82007475	ORNL/TM—7978
DE82007497	GA-A—16467
DE82007498	ORNL/SUB—7537/15
DE82007500	ORNL/MIT—337
DE82007501	ORNL/TM—7788
DE82007506	DOE/EV/04962—3
DE82007518	DOE/ER/04996—2
DE82007522	DOE/ER/10556—86
DE82007524	DOE/ER/04949—1
DE82007529	DOE/ET/52008—2
DE82007530	DOE/ET/20091—1
DE82007541	CONF-800626—9
DE82007541	DOE/ER/02892—29
DE82007553	SAND—80-0064
DE82007558	SAND—81-1927
DE82007559	SAND—81-0135-Rev.1
DE82007562	DOE/NASA/10769—21
DE82007562	NASA-TM—82734
DE82007565	SAND—81-7090/4
DE82007566	SAND—81-7086/5
DE82007626	BDX—613-2722
DE82007634	FERC—0069
DE82007636	PNL-SA—8408
DE82007645	BDX—613-2730
DE82007654	ORNL/Sub—81/21086/2
DE82007654	WFPS-TME—81-026
DE82007670	DOE/PETC/TR—82/5
DE82010011	GJBX—182-Vol.2B(Midnite)
DE82010113	DOE/NASA/0124—6
DE82010113	ERC-TR—8125
DE82010113	NASA-CR—165182
DE82010967	USGS-OFR—80-450
DE82010975	LA—9071-MS
DE82010983	EPA—600/7-81-087
DE82010983	LA—8826-PR
DE82010987	LA—8959-PR
DE82010991	UCID—19206
DE82010992	UCID—19291
DE82010994	BNL—51390
DE82700072	AERE-PR/TP—37
DE82700073	AERE-R—10207
DE82700074	AERE-R—9986
DE82700075	AERE-TP—876
DE82700076	CBPF-A—0005/80
DE82700077	CBPF-A—0017/80
DE82700078	IPPJ-AM—15
DE82700079	JAERI-M—9310
DE82700080	JINR—E-7-12219
DE82700081	JINR-R—4-81-72
DE82700082	CBPF-A—0004/80
DE82700083	CBPF-A—0007/80
DE82700084	CBPF-A—0010/80
DE82700085	CBPF-A—0013/80
DE82700086	CBPF-A—0021/80
DE82700087	CBPF-A—0022/80
DE82700088	CBPF-NF—023/80
DE82700089	CBPF-NF—029/80
DE82700090	FEI—1109
DE82700091	FEI—1130
DE82700092	IAE—3261/11
DE82700093	IAE—3308/9
DE82700094	IFUSP-P—239
DE82700095	IFVE-OP—81-17
DE82700096	JINR—E-17-81-60
DE82700097	JINR-R—14-81-177
DE82700098	JINR-R—17-80-814
DE82700099	KAERI/RR—267/80
DE82700100	PUC-tn—05/80
DE82700101	PUC-tn—07/80
DE82700102	PUC-tn—17/80
DE82700103	EFI—442(49)-80
DE82700104	IAE—3268/7
DE82700105	IAE—3309/6
DE82700106	IAE—3321/8
DE82700107	IAE—3324/7
DE82700108	IFUSP-P—270
DE82700109	INIS-SU—33
DE82700110	IPPJ—472
DE82700111	IPPJ—473
DE82700112	IPPJ—474
DE82700113	IPPJ—475
DE82700114	IPPJ—476
DE82700115	IPPJ—477
DE82700116	IPPJ—478
DE82700117	IPPJ—480
DE82700118	IPPJ—481
DE82700119	IPPJ—483

Order No.	Report No.
DE82700120	IPPJ—484
DE82700121	IPPJ—485
DE82700122	IPPJ—486
DE82700123	IPPJ—487
DE82700124	IPPJ-DT—82
DE82700125	ITEF—12(1981)
DE82700126	ITP—80-108-E
DE82700127	JAERI-M—9213
DE82700128	JAERI-M—9242
DE82700129	JAERI-M—9354
DE82700130	KAERI/RR—256/80
DE82700131	KAERI/RR—275/80
DE82700132	NIIEFA-P-K—0470
DE82700133	NIIEFA-P-K—0488
DE82700134	SFTI—10
DE82700140	IAE—3338/10
DE82700141	JINR—8-80-536
DE82700188	EFI—421(28)-80
DE82700189	EFI—431(38)-80
DE82700190	JINR-R—14-80-793
DE82700191	AERE-R—10206
DE82700192	IAE—3313/1
DE82700193	CONF-800155—2
DE82700193	IFUSP-P—206
DE82700194	IFUSP-P—225
DE82700195	IFUSP-P—240
DE82700196	IFUSP-P—241
DE82700197	IFUSP-P—244
DE82700198	IFUSP-P—245
DE82700199	IFUSP-P—246
DE82700200	IFUSP-P—249
DE82700201	IFUSP-P—250
DE82700202	INS—393
DE82700203	ITEP—13(1981)
DE82700204	JINR—18-80-540
DE82700205	JINR—E-1-80-799
DE82700206	JINR—E-1-81-154
DE82700212	JINR-R—2-80-774
DE82700214	JINR-R—4-81-148
DE82700215	JINR-R—4-81-243
DE82700218	INS—398
DE82700222	JINR—1-81-82
DE82700224	JINR-R—15-80-762
DE82700225	JINR-R—15-80-786
DE82700226	JINR-R—15-81-151
DE82700227	JINR-R—3-80-779
DE82700228	JINR-R—3-81-19
DE82700229	JINR-R—6-81-23
DE82700230	JINR-R—7-12054
DE82700231	JINR-R—7-12056
DE82700232	JINR-R—7-12061
DE82700235	NSSRP—38
DE82700235	UTTAC—38
DE82700236	UTTAC—39
DE82700238	INIS-mf—6777
DE82700239	IPEN-Pub—17
DE82700240	JINR—18-80-841
DE82700241	KAERI/RR—210/80
DE82700243	KAERI/RR—244/80
DE82700244	KAERI/RR—272/80
DE82700245	PUC-tn—22/80
DE82700246	PUC-tn—24/80
DE82700247	AAEC/E—512
DE82700248	FEI—1094
DE82700249	JAERI-M—9159
DE82700250	JINR—6-81-75
DE82700252	KAERI/RR—241/80
DE82700254	ARL/TR—034
DE82700255	IAE—3303/13
DE82700259	JAERI-M—9336
DE82700266	CNEN-DIN—01/80
DE82700267	FEI—1046
DE82700268	FEI—1113
DE82700269	FEI—1145
DE82700270	FEI—1149
DE82700271	KFTI—81-15
DE82700272	IEA-DT—141
DE82700281	PUC-tn—02/80
DE82700282	ARL/TR—037
DE82700324	FEI—1095
DE82700329	FEI—1128
DE82700332	NIIAR—15(468)
DE82700353	KFTI—80-45
DE82700356	CONF-7904182—1
DE82700356	RI—120
DE82700357	RL—81-054
DE82700358	RL—81-061
DE82700360	KAERI/RR—221/80
DE82700361	CTA-EAV—024/79
DE82700362	FEI—1019
DE82700363	FEI—1079
DE82700364	FEI—1097
DE82700365	FEI—1100
DE82700366	FEI—1110
DE82700367	FEI—1126
DE82700368	FEI—1138
DE82700369	IAE—3280/5
DE82700370	IAE—3288/5
DE82700371	IAE—3377/5
DE82700372	KAERI/RR—201/80
DE82700373	KAERI/RR—231/80
DE82700374	FEI—1104
DE82700377	FEI—1089
DE82700378	ITEF—122(1980)
DE82700379	KAERI/RR—242/80
DE82700380	KAERI/RR—245/80
DE82700381	KAERI/RR—224/80
DE82700382	JAERI-M—9403
DE82700383	JAERI-M—9404
DE82700385	KAERI/RR—222/80
DE82700386	KAERI/RR—223/80
DE82700387	KAERI/RR—225/80
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DE82700396	KAERI/RR—243/80
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DE82700407	AECP—8(Pt.2)
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DE82700409	FEI—1099
DE82700410	FEI—1112
DE82700411	IAE—3281/2
DE82700412	IFVE-OEF—80-141
DE82700413	IFVE-OEF—81-45
DE82700414	IFVE-OEF—81-63
DE82700415	IFVE-OEIPK—80-143
DE82700416	IFVE-ONF—81-24
DE82700417	INIS-SU—60
DE82700418	ITEF—159(1980)
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DE82700420	JINR—11-81-300
DE82700422	JINR—13-80-808
DE82700423	JINR-R—1-81-30
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DE82700425	JINR-R—13-12037
DE82700426	JINR-R—13-81-18
DE82700427	JINR-R—13-81-298
DE82700428	JINR-R—13-81-74
DE82700429	JINR-R—16-80-448
DE82700430	JINR-R—16-81-330
DE82700431	KAERI/RR—218/80
DE82700432	KAERI/RR—247/80
DE82700433	KIYI—80-8
DE82700434	NIIAR—41(449)
DE82700435	NRPB-R—113
DE82700436	PEL—275
DE82700437	PEL—277
DE82700438	RL—81-053
DE82700439	FEI—1061
DE82700440	IAE—3363/7
DE82700441	ITEF—112(1980)
DE82700442	JINR—1-81-29
DE82700444	JINR—13-81-11
DE82700445	JINR-R—10-81-83
DE82700446	KAERI/RR—236/80
DE82700447	KAERI/RR—238/80
DE82700448	KAERI/RR—262/80
DE82700449	RI—136
DE82700460	JINR—E-11-80-782
DE82700461	JINR-R—11-12133
DE82700462	EFI—401(8)-80
DE82700463	FEI—1022
DE82700464	IAE—3275/5
DE82700465	IFVE-ONF—81-5
DE82700466	ITEF—162(1980)
DE82700467	ITEF—164(1980)
DE82700468	ITEF—168(1980)
DE82700469	ITEF—176(1980)
DE82700470	JAERI-M—9167
DE82700473	JAERI-M—9235
DE82700474	JAERI-M—9359
DE82700477	JINR—10-81-159
DE82700478	JINR—9-81-304
DE82700479	JINR—E-10-80-787
DE82700480	JINR-R—10-80-861
DE82700481	JINR-R—10-81-315
DE82700482	JINR-R—10-81-316
DE82700483	JINR-R—10-81-342
DE82700484	JINR-R—10-81-56
DE82700485	PER—61
DE82780020	CONF-8005190—(Pt.2)
DE82780020	INIS-mf—6612
DE82780032	CONF-810270—6
DE82780032	FRNC-CONF—206
DE82780038	CONF-7903161—
DE82780038	INIS-mf—6726
DE82780038	IWGRRPC—79/4
DE82780039	CONF-7911167—(Absts.)
DE82780039	INIS-mf—6737
DE82780059	INIS-mf—6729
DE82780091	KFK—3084
DE82780093	KFK—2856
DE82780100	Juel-Spez—88
DE82780105	PLF—31
DE82780183	HMI-B—332
DE82780187	INIS-mf—6830
DE82780192	INIS-mf—6798
DE82780193	INIS-mf—6825
DE82780194	INIS-mf—6831
DE82780195	CONF-8104139—
DE82780195	INIS-mf—6793
DE82780202	INIS-mf—6753
DE82780203	INIS-mf—6840
DE82780204	INIS-mf—6833
DE82780208	CONF-7909240—
DE82780208	IPPJ-AM—13
DE82780209	CONF-8003163—
DE82780209	JAERI-M—8971
DE82780211	KFTI—80-46
DE82780212	KFTI—80-48
DE82780213	CONF-7911169—
DE82780213	IPPJ—438
DE82780214	KFTI—80-37
DE82780216	CONF-791275—
DE82780216	INS-NUMA—18
DE82780217	CONF-791243—
DE82780217	JAERI-M—8769
DE82780219	CONF-7903162—
DE82780219	KEK—79-34
DE82780220	CONF-7811197—
DE82780220	KUkRI-TR—197
DE82780223	CONF-790278—
DE82780223	INIS-SU—61
DE82780224	INIS-mf—6769
DE82780226	CONF-8009198—(Pt.1)
DE82780226	INIS-SU—40
DE82780229	INIS-SU—39
DE82780240	INIS-mf—6766
DE82780241	INIS-SU—67
DE82780242	INIS-mf—6765
DE82780243	INIS-mf—6770
DE82780248	INIS-mf—6752
DE82780255	KFK—3051
DE82780257	KFK—3142
DE82780258	KFK—3163
DE82780259	KFK—3164
DE82780260	KFK—3165
DE82780272	IPP—4/188
DE82780277	DFVLR-FB—79-32
DE82780278	EUR—7050e
DE82780278	KFK—3088
DE82780279	KFK—3078
DE82780281	CONF-8005128—2
DE82780281	GKSS—80/E/33
DE82780282	GKSS—80/E/36
DE82780285	CONF-8004194—1
DE82780285	KFK—2974
DE82780287	BMFT-FB-T—81-009
DE82780288	PLF—39
DE82780289	IPP—6-201
DE82780290	Juel—1672
DE82780299	KFK—3170
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DE82901095	NP—2901095
DE82901096	NP—82901096
DE82901104	NP—2901104
DE82901105	NP—2901105
DE82901106	NP—2901106
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DE82901109	NP—2901109
DE82901180	NP—2901180
DE82901337	AERE-R—10095
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DE82901424	NP—2901424
DE82901432	NYSERDA—80-36
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DE82901472	NP—2901472
DE82901830	EPRI-FP-[illegible]71-Vol.3
DE82901890	NP—2901890
DE82901989	INDC(JAP)—61/G
DE82901989	JAERI-M—9714
DE82901989	NEANDC(J)—74/AU
DE82902007	EPRI-EA—235-Vol.3
DE82902128	CONF-810865—10
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